# THE Journal

OF THE AMERICAN DENTAL ASSOCIATION

MARCH

1956


CONTENTS


| | | | |
|---|---|---|---|
| Bulletin—Needs for dental research | 1-a | Cases and comments | 332 |
| Nutrition requirements and faddists' claims—Griffith | 264 | Reports of councils and bureaus | 334 |
| Oral manifestations of systemic disease—Kreshover | 271 | Editorials | 357 |
| Nutritional therapy and periodontal disease—Glickman | 275 | International correspondence | 362 |
| Nutrition and the tooth—Leicester | 284 | News of dentistry | 364 |
| History of the Newburgh-Kingston study—Hilleboe | 291 | Current literature | 382 |
| Newburgh-Kingston study. XIII—Schlesinger | 296 | Book reviews | 384 |
| Fluoride metabolism and water fluoridation—Hodge | 307 | Deaths | 392 |
| Newburgh-Kingston study. XIV—Ast | 314 | Directory | 397 |
| Establishing just fees for patients—Dodd | 325 | Announcements | 399 |



VOLUME 52

NUMBER 3

Styled by Walter Dorwin Teague
the NEW STANDARD for MODERN OPERATORIES
...a Ritter CENTURY Unit and
Ritter CENTURY Chair
The new Ritter Century dental unit offers a wide range of increased engine speeds plus exclusive Ritter Fluidair cooling, designed to meet the requirements of the latest high-speed techniques. A Ritter Century Unit and Motor Chair bring you maximum operating ease and efficiency, in addition to the greatest comfort for your patients. See them at your Ritter dealer's now . . . or write the Ritter Company, Inc., 1015 Ritter Park, Rochester 3, N. Y.
Ritter Company Inc.


The Journal of the American Dental Association is published monthly by the American Dental Association at 222 E. Superior St., Chicago 11, Ill. Printed in U.S.A. Second class mail privileges authorized at Chicago, Ill. Subscription $7.00 a year in U.S.A.; $8.00 foreign. Issue of March, 1956, Vol. 52, No. 3. Copyright 1956 by the American Dental Association.

## SPECIAL BULLETIN

# Funds for dental research: Association presents views on need for increased federal appropriations for dental research

On February 17 representatives of the American Dental Association appeared before the Subcommittee on Labor, Health, Education and Welfare of the Appropriations Committee of the House of Representatives and petitioned Congress to increase federal appropriations for dental research. Harold Hillenbrand, secretary of the Association, speaking for the dental profession, testified regarding the prevalence of dental disorders, their impact on the health and economy of the country, and the need for increased federal appropriations which would permit exhaustive study of the etiology, prevention and cure of such diseases.

Dr. Hillenbrand's testimony was presented after the March issue of THE JOURNAL had gone to press. Because of its importance to dentists and to others interested in the health of the nation, it is brought to you in this special bulletin. For other information on this subject, see the editorial on page 357 and the special news story in this issue. JOURNAL readers who favor increasing dental research and an increase in federal funds for that purpose are urged to make their wishes known to their congressional representatives. Dr. Hillenbrand's testimony follows:

I am Harold Hillenbrand, secretary of the American Dental Association, which has a total membership of 85,000, representing 85 per cent of the nation's dentists. I am a former member of the National Advisory Dental Research Council. I am here today to present the Association's recommendation on the appropriations for the dental health activities of the U. S. Public Health Service. With me is Mr. Bernard J. Conway, secretary of the Association's Council on Legislation.

### ASSOCIATION'S RECOMMENDATION

In the budget proposed for 1957, $2,971,000 is allocated for all dental health activities in the Public Health Service. Of this sum, $800,000 is allocated to dental research grants which will go to nonfederal institutions and be administered by the National Institute of Dental Research. The Association recommends that the sum of $800,000 be increased to $3,855,000 in order to provide the following:

| | |
|---|---|
| $330,000 | to continue research projects now in operation |
| $870,000 | to initiate projects already approved or to be approved by the Institute prior to July 1, 1956 for which funds are not now available |
| $2,655,000 | to initiate additional dental research projects in nonfederal institutions in order to utilize the present capacity of these institutions for additional research activity |

In this brief statement, the Association will show that this increase in research grants can be amply justified in terms of

human health and in the productive expenditure of funds.

### PRESENT DENTAL RESEARCH RESOURCES

At the outset, it should be noted that resources for additional dental research are markedly limited, and that the present urgent need can be met only through increased federal support. The 43 dental schools and 7 dental research centers are practically without endowment and are already heavily burdened with their effort to increase and support facilities urgently needed to train an adequate supply of dentists and dental hygienists. The dentists of the country, through the American Dental Association, have themselves attempted to meet this need for research and are currently spending almost a quarter of a million dollars a year in direct research efforts. The research resources of the great pharmaceutical industry are not generally available for use on dental problems, nor is there wide public support for dental research. The Association believes that there is no present, practicable alternative except increased federal support in this great health problem.

### FEDERAL SUPPORT OF DENTAL RESEARCH

In the past few years, the interest of the federal government in health research problems has expanded greatly, but dental health problems have not been a notable beneficiary of this increased interest. The National Institute of Dental Research was established by Public Law 755, 80th Congress, in 1948 and, in the intervening seven years, money spent for dental health activities has increased by only 23 per cent.

This is the sharpest of contrasts to the budgetary increases which have been allocated to the other components of the National Institutes of Health:

National Cancer Institute, 1939-1956—6,000 per cent increase
National Institute of Mental Health, 1948-1956—400 per cent increase
National Heart Institute, 1950-1956—100 per cent increase
National Institute of Arthritis and Metabolic Diseases, 1950-1956—600 per cent increase
National Institute of Allergy and Infectious Diseases, 1950-1956—200 per cent increase
National Institute of Neurology and Blindness, 1951-1956—3,200 per cent increase

The Association acknowledges that some priority might properly be given to problems that are related to a high death rate; but it does not believe that such priority should be perpetuated at the cost of problems which, while less dramatic, take a relentless toll of human health and well-being.

The case of the common cold is a good case in point. It is almost as universal as dental disease; it is more annoying than dramatic; it is rarely if ever a direct cause of death, yet it takes an enormous annual toll in terms of ill-health and disability. The cause and prevention of the common cold are the endless objects of research. Dental diseases should have the same type of investigation and study until the final goal is achieved.

### DIMENSIONS OF DENTAL HEALTH PROBLEMS

It is generally acknowledged that the dental profession in the United States has achieved world leadership, yet the problems of dental disease are still of tremendous proportions in this country.

Almost all persons suffer from oral disease at some time during their lives.

Dental caries, or tooth decay, is the most prevalent disease in the United States.

Seventy-five per cent of the people who lose teeth, lose them because of periodontal diseases, so-called pyorrhea.

Twenty per cent of our children suffer from severe deforming irregularities of the teeth.

One child out of every 800 born alive suffers from the severe deformity of cleft palate and lip, sometimes called "harelip."

Twenty-five per cent of the adult population is wearing one or two full dentures (plates) as a result of previous dental disease.

If this picture is seen in total, no one can gainsay that it is dramatic in terms of its unceasing drain on the national health.

In terms of cost to the nation, the problem is of equally great proportions. The nation's civilian dental bill is 1½ billions of dollars, almost 13 per cent of the national expenditure for all private health services. The federal government spends many millions more and utilizes the services of more than 6,000 dentists in the Armed Forces alone to combat dental disease. And in spite of these very large outlays, less than one half of the population receives adequate dental care. It is simply not reasonable to say that this pattern of disease and cost should be continued without effective intervention by the only available weapon—dental research.

It is obviously futile to attempt to continue to solve a problem of this proportion by the endless treatment of the disease after it occurs. The only means of solution will be found in the prevention of the diseases and in their control in the early stages. These means can be provided only through increased dental research.

The great modern public health approach to the problem of tooth decay—the fluoridation of public water supplies—is a demonstration of the great potential that lies in dental research. Through a relatively cheap procedure, millions of children in the younger age groups will be spared about 60 per cent of the tooth decay that could otherwise be anticipated. Surely other great strides in this gigantic health problem can also be made through dental research.

## AREAS FOR EXPANDED RESEARCH

No toothpaste has been shown to date to be effective in controlling tooth decay in spite of the claims that are made in the magazines, newspapers, radio and television. But dental research holds out the hope that this objective can eventually be achieved.

There is the possibility that dental research can increase the effectiveness of fluoridation of public water supplies beyond its present limits of 60 per cent.

There is the possibility that dental research can find or develop a sugar which will not cause decay of the teeth.

There is the possibility that the application of topical fluoride solutions, now only 40 per cent effective in preventing tooth decay, can have its range of effectiveness increased.

There is the possibility that a decade or two of research may reveal methods for bringing the periodontal diseases such as pyorrhea and gingivitis under a larger measure of control.

There is the possibility that dental research can so alter the course of dental diseases so as to permit the offering of insurance protection under programs similar to Blue Cross and Blue Shield.

There is the possibility that millions of children can be spared the deforming and disabling conditions which accompany severely crooked teeth by extended research in the field of child growth and development in the science of orthodontics.

There is the possibility of clarifying the relation between dental disease and heart disease as was done in the prevention of subacute bacterial endocarditis by adequate antibiotic prophylaxis of susceptible individuals before dental operation.

There is the possibility that new knowledge will reveal why the mouth is one of the chief sites of cancerous lesions and will produce better methods for their early detection.

There is the possibility of obtaining a better understanding, through dental research, of dental problems related to nutrition, to the treatment of handicapped persons and those chronically ill, to occupational diseases, radiation hazards, hearing and many other factors.

But, under present lack of support, many of these urgent and far-reaching studies will be delayed for many years with resultant effect on the health of the American people.

### FACILITIES AND PERSONNEL AVAILABLE

There is substantial evidence that personnel, projects and facilities for the recommended dental research program could be marshalled quite rapidly if increased support became available.

The 43 dental schools and 7 dental research centers have more than 700 full-time staff members capable of undertaking research projects. In addition, many research workers in the basic sciences and allied health sciences could be enlisted in projects of potential dental interest. If such principal workers were supplied with adequate assistance at the technical level by the provision of funds, a very sizable expansion of dental research could take place almost at once.

Under the present appropriation to the National Institute of Dental Research, the $421,000 currently provided for the grants is used to support only about 45 different projects. To keep the 45 projects in operation in the next fiscal year will require a minimum of $330,000.

In addition, the National Institute of Dental Research has approved, or will approve by July 1, 1956, additional projects which would require an additional $870,000. Obviously, if additional funds are not provided even this token enlargement cannot now be undertaken.

In a recent survey, the Council on Dental Research of the American Dental Association found that 43 dental schools and 7 dental research centers could undertake 265 additional dental research projects during the next fiscal year at an approximate cost of $2,655,000. The survey revealed that 20 dental schools can now undertake research projects requiring $1,500,000 or about $75,000 per school and that 14 schools could undertake $700,000 in research projects, or $50,000 per school. The nine remaining schools and the seven dental research centers could utilize $550,000 in grants or $25,000 per school and $32,857 per dental research center. The replies from the deans and directors of dental schools and research centers indicate a current need of almost $4,000,000 to support additional research projects. That is more than a million dollars over the conservative estimate of the Council on Dental Research.

It should be noted that the Association's recommendation for this enlarged support is not based on a sudden decision to expand a program but on the pent-up pressures which have accumulated over the many years in which dental research was inadequately supported. The Association believes that the time is now richly opportune to take advantage of these resources to produce a dental research program which can begin to measure up to its responsibilities.

### FEDERAL PROBLEMS IN DENTAL HEALTH

As a final comment, the Association wishes to point out the very real stake the federal government has in an expanded dental research program. The Department of Defense spends about $100,000,000 annually for the dental health care of the military. The dental bill for the Veterans Administration reached a total of $57,000,000 in 1948 and continued around that level until 1953 when the Congress felt compelled to restrict the increasing costs of meeting mounting dental need with new legislation. For that

five-year period, veterans' dental care cost a quarter-billion dollars; in comparison, the amount the Association asks for dental research is a pittance. In 1956, the VA dental program will cost an estimated 18 million dollars, an apparent saving of about $30,000,000 over the previous average annual cost of the program. If as little as 10 per cent of this saving, previously expended on terminal dental treatment, were now dedicated to an expanded research program not only would the federal government eventually be able again to meet its full responsibility for the dental health of veterans, but it would also be an inestimable contribution to all of the people of this nation. No investment in research will produce greater benefits, dollar per dollar, than in the field of dental research.

The American Dental Association urges Congress to launch now the dental research program this nation deserves. Specifically, the Association urges this Committee to increase the appropriation for the dental research grants administered by the National Institute of Dental Research from $800,000 to $3,855,000. The Association also urges that an appropriation for the construction of the dental institute building be approved at the earliest possible date. A description of the need for the dental institute building is attached to this statement. I request that it and the other attached documents be made part of the record. In behalf of the American Dental Association I wish to thank the Committee for the opportunity of presenting this testimony.

## THE NEED FOR AN APPROPRIATION TO CONSTRUCT THE NATIONAL INSTITUTE OF DENTAL RESEARCH BUILDING

Nearly eight years ago Congress authorized $2,000,000 to construct and equip a building to house the National Institute of Dental Research. The plans for the building were made in 1951 at a cost of nearly $100,000. Nothing further has been done on the building project.

The authorization of two million dollars is contained in Public Law 755, 80th Congress, the National Dental Research Act. Within a year of the enactment of the National Dental Research Act, the Public Health Service made plans to initiate the building construction. The Bureau of the Budget, however, did not allow a requested appropriation for $400,000 in cash and $1,500,000 for contract authorization in the fiscal year 1950 budget. At the recommendation of the American Dental Association, the Senate approved a full cash appropriation of $2,000,000. The fiscal 1950 appropriation bill as enacted, however, provided only for an expenditure of $100,000 for developing plans and specifications for the dental institute building. A request for the funds to construct the building was turned down by the Bureau of the Budget in fiscal 1951 and 1952. No request was made in fiscal 1953 and 1954 because of the Korean emergency. Since that time the agency has not included a request for the dental institute building funds in its budget despite the elimination of the Korean emergency restriction on new federal construction. The National Institute of Dental Research long ago outgrew the space assigned to it. Its facilities are scattered through several buildings; shifting of men from one laboratory to another has occurred frequently as the other institutes reclaim the space temporarily loaned to the dental scientists. But most importantly, there is extreme diffi-

culty in achieving an efficient coordination of the total dental research effort of the dental institute.

The dental institute building, as planned, would contain about 35,000 square feet (net) of working space. The present facilities for the dental scientists provide less than 10,000 square feet. Some of the dental schools have more working space for dental research than is assigned to the National Institute of Dental Research with its much larger scientific staff. New York University and the University of Minnesota are good examples. The former has 15,000 square feet of facilities available for dental research; the latter has 13,000 square feet.

Officials of the Public Health Service indicated in testimony on the fiscal 1950 and 1951 budgets that the Clinical Center and other planned construction could not provide adequate space for the dental institute. That prediction is now a fact. The space and facilities now occupied by the permanent staff of scientists at the National Institute of Dental Research are now inadequate. In the basic research area, seven men of "principal investigator" status are working in temporary laboratories borrowed from other institutes. Three of these men have been forced to move twice in the last year or so, and all are expected to make at least one more move in the near future.

At present, there is no area available to the dental scientists for a library or conference room where literature pertaining to dental research may be stored for convenient access to the dental staff. The scientific laboratories of the dental institute are scattered over an area corresponding to several city blocks. Investigators working on separate phases of a problem do not have an opportunity to check with each other as often as they should. This situation is especially regrettable for those in basic research disciplines who are attempting to collaborate with the clinical personnel. Members of the microbiology group, for example, are scattered in four separate buildings. It is virtually impossible to expect them to pool their efforts in clinical material.

The National Institute of Dental Research has a mandate from Congress to conduct investigations in two areas—basic research and clinical research. Unless plans are made now for constructing adequate facilities for the dental institute, its basic research program will become subservient to the clinical operations. The other institutes at the National Institutes of Health have developed clinical programs with their own separate and distinct groups of ancillary investigators. The dental institute has not been able to establish that desirable arrangement even though it would be of particular advantage to the dental institute because so much of dental research, both basic and clinical, crosses several scientific disciplines.

The obvious answer to the problem at the dental institute is the construction of a separate building to house its activities as planned in 1951. It is unfortunate, however, that the expenditure authorized in 1948 will not be sufficient to construct and equip the building as planned. The American Dental Association has requested the introduction of a bill during this session of Congress to increase the authorization of funds for the dental institute building from a ceiling of $2,000,000 to $5,000,000. Rep. J. Percy Priest of Tennessee, chairman of the House Committee on Interstate and Foreign Commerce, has already introduced a bill (H.R. 9087) reflecting the Association's recommendation. A similar bill will be introduced in the Senate shortly. The American Dental Association will urge the enactment of H.R. 9087 and its Senate counterpart during this session of Congress. The Association urges this Committee to give serious consideration to approving the building fund appropriation for the National Institute of Dental Research at the earliest possible date.

# For Precisely Fitting MOD's and Simple Inlays

JELENKO

MODULAY

REG. U.S. PAT. OFF

**CERTIFIED**

**TYPE B — MEDIUM HARD**

**GOLD COLOR**

per Dwt. $2.15

"MODULAY" is ideal for all non-abutment inlays. It is a nice gold to work with — it casts with rare precision and burnishes to feather-edged margins without chipping.

*Matching Solder*

*Jelenko "COLOR BLEND" Solder*

SCIENTIFICALLY SAFE — J. F. JELENKO & CO. INC. — FOR STRUCTURAL SERVICE

## J. F. JELENKO & CO., INC.

DENTAL GOLDS • SPECIALTIES

PRECISION CASTING EQUIPMENT

136 West 52nd Street • New York 19, U. S. A.

# MISSION ACCOMPLISHED.....

Another of the more than 100,000,000 cartridges of Ravocaine HCl and Novocain with Levophed, which dentists have used in the last 3 years, has bestowed its blessing of fast, quick, sure — and well-tolerated — anesthesia on another patient. Your patients, too, will appreciate...

**RAVOCAINE® HCl**

Brand of propoxycaine HCl

AND **NOVOCAIN®**

Brand of procaine HCl

with LEVOPHED® or COBEFRIN®

**SO FAST · SO DEEP · SO SURE**

Levophed Brand of [illegible] Corporation Cobefrin Brand of [illegible]

COOK-WAITE Laboratories, Inc.

[illegible] BROADWAY, NEW YORK [illegible], N. Y.

® Reg. Trademarks of Cook-Waite Laboratories

Incidentally ...
So efficacious is Xylocaine HCl 0.4% and Novocain 2% with Levophed 1:30,000 or Cobefrin 1:10,000 that less than the average volume usually is entirely adequate for routine cases.

# ELECTRIC EYES PROVE

## UNIDIRECTIONAL CURING

*An unretouched photograph of a Tilon test denture. Thermocouples were attached to various parts of a Tilon denture. The entire denture was processed. A highly accurate instrument took readings throughout the modern, electrical curing cycle. Tilon cured UNIDIRECTIONALLY.*

**TICONIUM**
413 No. Pearl St., Albany 1, N. Y.

Tilon dentures are cured one way — the right way — unidirectionally! As a Tilon denture is cured, shrinkage is compensated for through the use of an injector.

Result: A perfect fit everytime.

Tilon DENTURES HAVE

F IT C OLOR S TRENGTH

another *FIRST* by nu-dent

MODERN MIRACLE OF ESTHETICS

*for the discriminating dentist!*

nu-dent
*vacuum-fired*
in a patented vacuum furnace

Meta-por*

*Reg. U.S. Pat. Off.

porcelain-fused-to-gold
RESTORATIONS

**SUCCESSFUL CLINICAL APPLICATION . . .**

AFTER YEARS OF INTENSIVE TECHNICAL TESTING AND SUCCESSFUL CLINICAL APPLICATION, NU-DENT brings to the dental profession a new concept in restorations . . . combining the beauty and esthetics of porcelain with the strength and adaptability of gold!

Here's why NU-DENT META-POR RESTORATIONS are the most dramatic development in crowns, veneer crowns, fixed bridges, etc. of the last decade . . .

**IDEAL COLOR . . .**

META-POR porcelain colors are guaranteed to match all commonly used shade-guides. AND . . . these colors are not affected by mouth fluids! Nu-Dent's porcelain is specially formulated to fuse at 1875°F. *(It is not a low fusing porcelain).*

**EXCELLENT MARGINAL FIT . . .**

The waxing, investing and casting technique developed by NU-DENT is in compensatory harmony with regard to shrinkage and expansion . . . the special non oxidizing gold has a Brinnel hardness of 105 (type C hardness) and melts at a high point. It is tough and strong; does not "spring" or "spread" under stress!

**PRACTICALLY UNBREAKABLE . . .**

The surface of the gold is so treated that the porcelain *unites* chemically with the gold and the porcelain is guaranteed not to separate or peel away from the metal. *The completed restoration is practically unbreakable.*

**nu-dent PORCELAIN STUDIO, INC.**

220 West 42 St., N.Y. 36, N.Y. • Phone—LA 4-3591, 2, 3, 4, 5, 6
9615 Brighton Way, Beverly Hills, Cal., Phone—CRestview 5-8717

*Send Coupon for Indications and Preparatory Technic.*

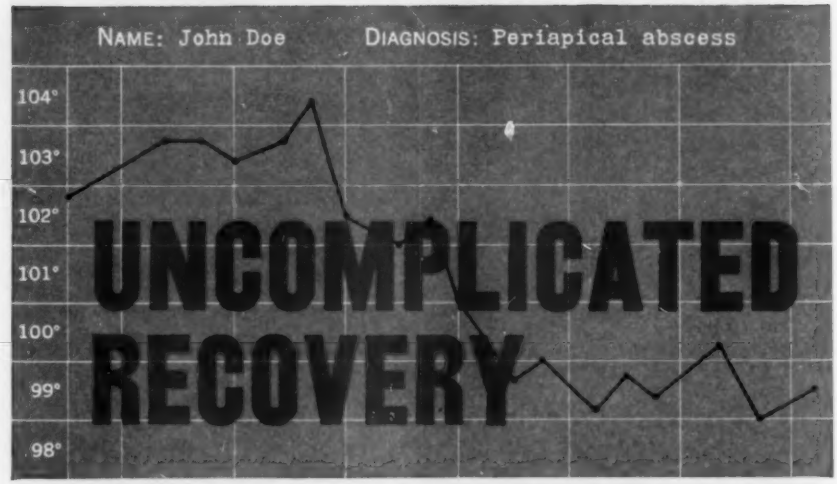
(Send to NU-DENT Studio Nearest You) ADA
**NU-DENT PORCELAIN STUDIO, Inc.**
Please send data on META-POR and other NU-DENT restorations.

Dr._____

Address_____

City & Zone_____ State_____

# GRAPHIC STORY




# WITH TETRACYN®

**Brand of tetracycline**

The role TETRACYN plays in reversing the course of infection is recorded daily in case histories everywhere. TETRACYN is a valuable adjunct in dentistry because it offers:

*good tolerance and convenience*

TETRACYN is well tolerated, acts with little or no side effects. There are many dosage forms to meet every need.

*rapid absorption and diffusion*

TETRACYN reaches peak levels about one hour after ingestion; acts quickly on the infectious agent.

*wide coverage and effectiveness*

TETRACYN is highly effective in many dental infections. When antibiotics are indicated as adjunctive therapy in dentistry, TETRACYN is an extremely valuable agent.

*Capsules: 250 mg., 100 mg. and 50 mg.*

*Dosage:* The average adult daily dose is one 250 mg. capsule four times a day. Therapy should be continued for at least 24 to 48 hours after symptoms have subsided.

Pfizer *Dental Department*
PFIZER LABORATORIES, *Division, Chas. Pfizer & Co., Inc.*, Brooklyn 6, N. Y.

for caries-active patients

recommend non-cariogenic

Amurol®

Sugarless Mints

**REFRESHING MINT FLAVOR!**

Deliciously sweet, but free from sugar. Available through drug, department and health food stores.

*Samples and literature on request.*
*Please give druggist's name and address.*

**AMUROL PRODUCTS COMPANY**
**116 S. Michigan Ave., Chicago 3, Ill.**

# Restful hobby for busy people

Organ music is the most relaxing of all music, psychologists maintain. And now, busy professional people who have never played music before are amazed to find they can enjoy themselves at the Hammond Chord Organ. You can start right in playing, without lessons or tedious practise.

**You can play a tune in 30 minutes on the Hammond Chord Organ**

*One finger* plays the melody. *One finger* adds rich, full chords.

If you don't read notes, you use Picture Music that anyone can follow. In a few weeks, you'll be playing all sorts of selections —popular, religious, even classical!

Try the Hammond Chord Organ at your dealer's and see. No obligation. And mail coupon for further details. $975, f.o.b. Chicago, in Walnut. Blond or Ebony slightly higher. Terms arranged.

## The Hammond Chord Organ

**by the makers of Hammond Organs**

Hammond Organ Company
4242 W. Diversey Ave., Chicago 39, Illinois
Without obligation, send details about the Hammond Chord Organ.

Name_____

Address_____

City_____ Zone____ State_____

© 1955, HAMMOND ORGAN COMPANY 3

# COE-flex®

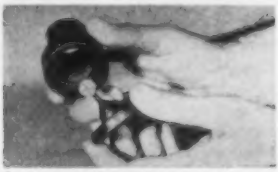
## the most outstanding rubber composition material in the world!

**Special: 2 for $9.00**

Frankly, *you may find it hard to believe* that Coe-Flex has properties *so far beyond* the existing standards and specifications of alginates and hydrocolloids . . . until you try Coe-Flex. So we are making it easy and economical for you to try Coe-Flex by offering 2 packages for the low price of $9.00. We want you to experience at first hand Coe-Flex's great accuracy —the fact that it exhibits NO shrinkage, NO expansion during setting, and that its dimensions are MAINTAINED during storage. It can be poured anytime and safely shipped! It's easy to use, requires NO fixing. For the best impressions you've ever made — inlays, partials or full dentures — order Coe-Flex today.

Coe-Flex is the only rubber base material that includes an Adhesive and a Retarder in every package—and at no extra cost. The Adhesive firmly attaches Coe-Flex to compound, metal, or plastic surfaces. The Retarder assures control of setting time.

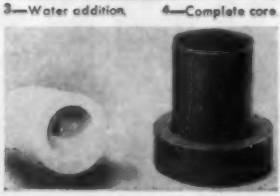
COE Laboratories, Inc. • Chicago 21, Illinois



1—Inserting inlay in rubber mold.

2—Pouring investment.

3—Water addition. 4—Complete core.



## *For the New Controlled Water Addition Process!*

- ★ **Simple low-heat technique**
- ★ **Assured accuracy**
- ★ **Controlled expansion**
- ★ **Perfect casting every time!**
- ★ **Available in convenient AQUA-PAK envelope...also in cans.**

***Write for technical literature.***

**THE RANSOM & RANDOLPH CO.**
**TOLEDO, OHIO**

# FOR THOSE "PF" DENTURE PATIENTS

## don't let their "Psychological Failures" defeat Perfect Fit

For many new denture patients, the complete success of your work may hinge on *more* than providing a denture that fits perfectly and is beautiful in appearance. To a large degree, it may depend on easing adaptation difficulties, to make it possible for the patient to adjust readily. Otherwise apprehension and awkwardness may lead to persistent complaints of discomfort and instability, through "psychological failure".

For potential "PF" patients, the soft resilient cushion provided by Wernet's Powder makes retention and stability seem so much easier...and adequate self-confidence so much more assured. And there's more comfort, too, because of the absorption and distribution of unaccustomed pressures on sensitive tissues.

While such practical assistance is almost indispensable for patients with anatomical or emotional problems, it can helpfully smooth the achievement of "denture-wearer" satisfaction for *all* patients.

Wernet Dental Mfg. Co., Inc., Jersey City 2, N. J.

*Speeds the Mastery of the*

# WERNET'S POWDER

*Denture*

**FREE PROFESSIONAL SAMPLES**

**WERNET DENTAL MFG. CO., INC., Jersey City 2, N. J.**

Please send me professional samples of Wernet's Powder.

Dr._____
(Please Print)

Address_____

City_____ Zone____ State_____

Dept. 16-C

# WERNET DENTAL LORE

MARCH, 1956

During the late 17th century, a rational treatment of diseases of the maxillary sinus, still practiced today, was introduced by the British physician, William Cowper (1666-1709). In order to empty Highmore's antrum of deposits and carry out the necessary irrigation, Cowper extracted the first permanent molar and then used a pointed instrument to penetrate through its alveolus into the sinus.

• • •

The mistaken notion propagated by Galen and his followers—that the teeth were bones—was invalidated by Fallopius (1523-1562), who compared the embryological development of teeth with that of feathers. This comparison was the point of departure for later embryological researches, which clearly showed the real nature of the teeth.

• • •

An important clinical procedure was born when the great anatomist Vesalius (1514-1564), suffering from a painfully erupting wisdom tooth, carried out a successful experiment on himself by scarifying his gums in the region of the molar and piercing the osseous plate which covered it. At that time, difficulties in the eruption of the third molar were usually dealt with by dosing the patient with pills or extracting his other teeth.

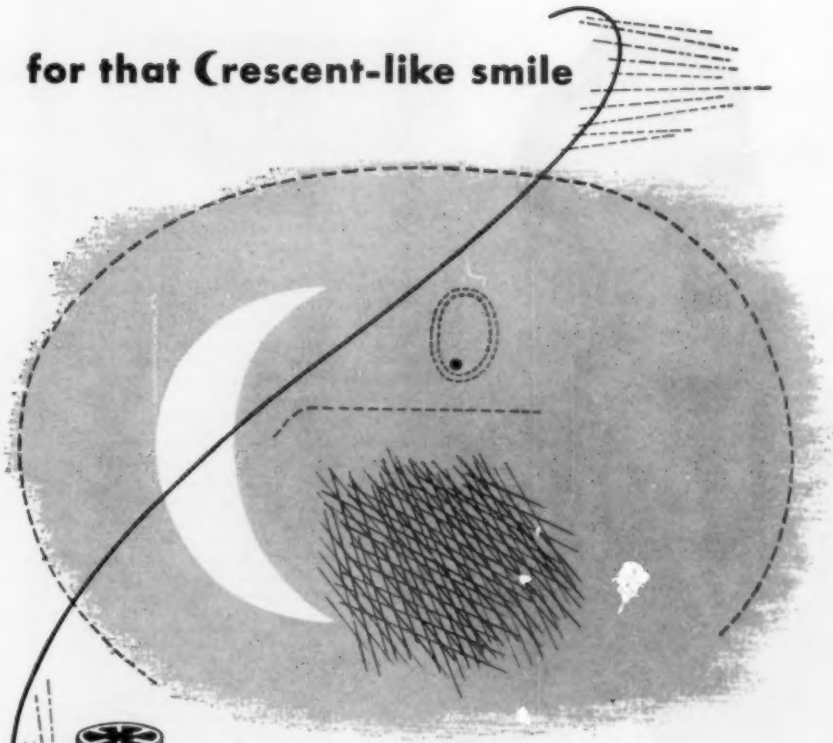
• • •

One of dentistry's unsolved mysteries is the can of ether found in the effects of Jean Pierre Le Mayeur after his death in 1806. Le Mayeur, a French dentist, practiced in this country during and after the Revolution, and died 35 years or so before ether was ever introduced as an anesthetic.

• • •

For hundreds of years, forest products have been employed in India in diverse and practical ways. In the fourth century A.D., books made of birch bark or palm leaves were in common use throughout the country. Today, Gum karaya—collected from the Indian gum trees—is refined to supply the basic ingredient for Wernet's Powder.

# for that Crescent-like smile



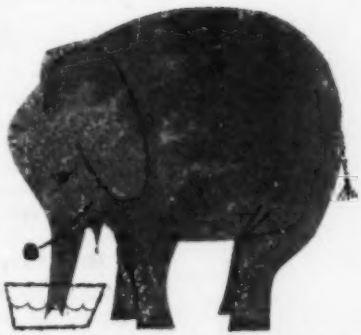
There's nothing like *Crescent Webbed Polishers* for making patients' teeth sparkle. These efficient rubber cups have built-in webs, or retainers, to hold the abrasive even at high speeds. Thus they do better work, do it more quickly, and do it without splashing or spraying the patients. The webbed design provides more working surface, conforms better to tooth surface. Permanently mounted, they fit your handpiece, run true. Patients like their smooth, gentle operation. Available through your dealer for very little.

$1.00 per dozen
$10.00 per gross

**CRESCENT DENTAL MFG. CO.**
**1839 S. Pulaski Road, Chicago 23, Illinois**

**concentrated...**

**just a few drops**



**instead of a swiggerful**

**with economical Astring-o-sol**

Astring-o-sol mouthwash is an efficient detergent and effective deodorant. It's mildly astringent, refreshing and invigorating. It tastes good — even children like it. Being concentrated Astring-o-sol is *used by the drop* not by the swigger. A little goes a long way — at the chair and in daily mouth care.

**write for samples for patient distribution**

AMERICAN FERMENT COMPANY, INC., 1450 Broadway, New York 18, N. Y.

EACH NEW DENTURE
IS A PROFESSIONAL
INVESTMENT IN FUTURE
PRESTIGE

**Will *your* dentures still do justice to your meticulous workmanship**

*–Six months after?*

Will your patient have cared for them properly – preserved their lustre and delicate molding? Will *you* still be proud of them, as representative of your prosthetic skill?

Your helpful instruction in the professionally approved method of denture cleansing, at the time of insertion, will help assure proper care – six months after, or six years after.

**The "Easy" Way is the "Best" Way**

The Polident "soak-and-rinse" method is so easy, so safe and gentle, yet so effective – it floats away debris, removes stains, and completely destroys all denture odors, without risk to fit and finish from harsh abrasive scrubbing or excessive handling.

Your patient ... and *your* prestige ... *ve* the best!

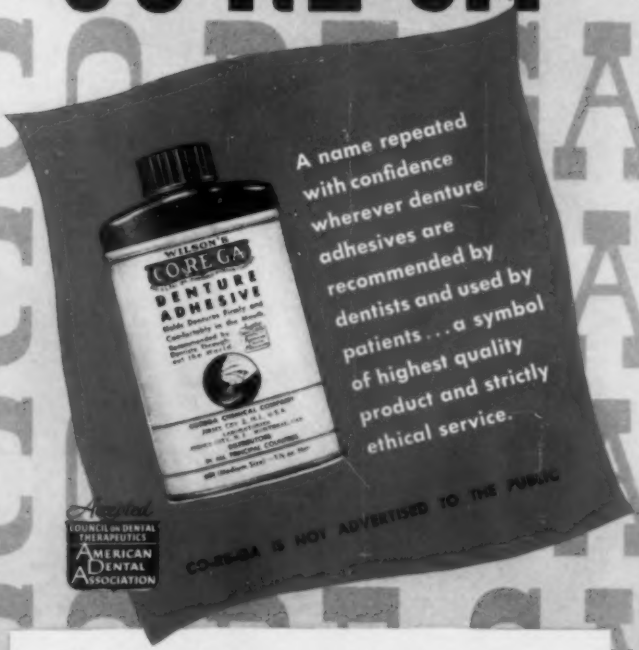
Write for generous supply of free office samples

**HUDSON PRODUCTS**
JERSEY CITY 2, N. J.

POLIDENT

*Recommended by more dentists than any other denture cleanser*

# CO-RE-GA


WILSON'S
CO-RE-GA
DENTURE ADHESIVE
A name repeated with confidence wherever denture adhesives are recommended by dentists and used by patients . . . a symbol of highest quality product and strictly ethical service.
CO-RE-GA IS NOT ADVERTISED TO THE PUBLIC
Accepted
COUNCIL ON DENTAL THERAPEUTICS
AMERICAN DENTAL ASSOCIATION

*Mail this coupon for your supply of professional samples*

Dr. _____
PLEASE PRINT

Address _____

City _____ State _____

**CO-RE-GA CHEMICAL CO. • 76 Mill Road, Jersey City 6, N. J.**

for most efficient
extraction technique

EXODONTIA
SPONGES

DENTAL DIVISION
Johnson & Johnson

MARCH 1956 VOLUME 52 • NUMBER 3

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

# Nutrition and oral health—facts and fads: a symposium

Ever since Galen established the humoral theory of tooth decay and connected nutritional disturbances with the causation of dental caries, the relationship of diet and nutrition to dental disease has concerned an ever increasing number of people. During the eighteen hundred years that have elapsed since the days of Galen, much has been learned about the effect of foods on general as well as on dental health. Much that has been learned must be unlearned, as is pointed out in the following four papers which were presented at the ninety-sixth annual session of the Association last October.

The four authors, agreeing that man's knowledge of foods is both incomplete and inaccurate, plead for reasonableness and moderation in making and accepting claims for specific items of food. Wendell H. Griffith cautions against the dangers of nutritional faddism and recommends the utmost accuracy in evaluating and interpreting dietary findings. In slightly different words, Seymour J. Kreshover offers the same advice. Discussing the increasing research activity in the field of nutrition, he warns against the many unqualified persons who, assuming the pose of authority, "abuse, misuse and misinterpret" the limited known facts about nutrition. Irving Glickman, speaking from the standpoint of the periodontist, laments the paucity in dental literature of definitive information regarding the role of nutritional therapy in the management of periodontal disease. Henry M. Leicester looks toward the future of nutritional research in dentistry with the hopeful eye of the optimist. Researchers, he advises, are now turning their attention to the detailed effects of nutritional factors which previously have been given only general consideration. This new approach, he anticipates, not only will result in new discoveries which will improve the form and health of the teeth but will eliminate some of the older ideas whose "validity cannot be established by rigorous, controlled investigation."

# Nutritional requirements and faddists' claims

*Wendell H. Griffith, Ph.D., Van Nuys, Calif.*

The fact that a symposium was arranged on the relation of the diet to dental and oral health in general and to the teeth, the periodontal tissues and the jawbones in particular leads to two obvious conclusions. First, the topic is of importance and, second, the problem is current and unresolved. The inclusion in the symposium of a paper on nutritional faddism leads to a third conclusion; that faddism is an obstruction, an interference with the attainment of nutritional goals, not only with respect to dental health but also with respect to all aspects of well-being.

Faddism, although by no means new, has been discussed recently from a variety of viewpoints.[1-5] In this presentation, there has been no yielding to the temptation to limit the discussion to a listing of required nutrients, both names and amounts, and to a reciting of evidence for the unsatisfactory nature of faddists' claims about these nutrients. Such a simple and direct approach has not proved a particularly effective procedure in the past. Rather, attention shall be directed to the nature of and to reasons for immoderate or extreme viewpoints about foods and nutrition. Arguments are persuasive only if they satisfy. The extremist must be understood before he can be persuaded to become an enthusiast for reasonableness rather than for unreasonableness in dietary matters.

Possibly, some who follow the banner of nutritional orthodoxy forget that the goal of the sincere food extremist and the goal of the most conservative nutrition scientist may be one and the same; that is, the maximum benefit to health from the proper selection of foodstuffs. That there are divergent viewpoints is to be expected in any population of greatly varying backgrounds, economic status and educational attainments. But the question may well be raised, "Will we not progress more rapidly toward the goal of nutritional health by insuring that our beliefs are reasonable and convincing and by redoubling our efforts to indoctrinate the public with sound nutritional principles than by the negative method of decrying the ideas which others erroneously accept as right?" Is there not some way to avoid the impression that faddists and nonfaddists are striving for different goals rather than for an identical goal?

Presented as part of a panel discussion, "Nutrition and Oral Health—Facts and Fallacies," before the Sections on Research, Public Health and Periodontics, ninety-sixth annual session, American Dental Association, San Francisco, October 18, 1955.

Chairman, department of physiological chemistry, School of Medicine, University of California Medical Center, Los Angeles.

1. Sipple, H. L., and King, C. G. Food fads and fancies, a health problem. J. Agri. Food Chem. 2:352 March 1954.

2. Sebrell, W. H., Jr. Food faddism and public health. Fed. Proc. 13:780 Sept. 1954.

3. Beeuwkes, A. M. Food faddism and the consumer. Fed. Proc. 13:785 Sept. 1954.

4. Nelson, E. M. Control of nutrition claims under the Food, Drug and Cosmetic Act. Fed. Proc. 13:790 Sept. 1954.

5. King, C. G., and Sipple, H. L. Educational and economic hazards imposed by faddists. Fed. Proc. 13:794 Sept. 1954.

The word "faddist" has been used in these introductory paragraphs. It will not be used again. In its place reference will be made to those who are immoderate in their beliefs about diet. An immoderate person is unreasonable, unrestrained, intemperate or given to excesses in his beliefs and practices. All degrees of immoderation occur. What is its nature and what can be done about it?

The number of unusual ideas about what and how to eat is legion, but those that attract the largest following and that frequently serve as a basis for the organization of immoderates into groups are concerned primarily with the alleged hazards of the processing of food. Bearing the brunt of the assault are agricultural products grown in quantity with the aid of chemical fertilizers and chemical pesticides, canned fruits and vegetables, pasteurized milk and, of course, white flour and refined sugar.

There is no simple explanation for immoderate beliefs about the assumed unsurpassed efficacy of raw or "natural" food, food grown in ground enriched only by so-called organic fertilizer. Financial gain through the merchandising of special dietary products is certainly the motive of some who capitalize on the gullibility of a large segment of the public. Financial gain is laudable, but not if it is the result of deliberate misrepresentation. Self-exploitation is the motive of others who utilize controversy as a means of exhibitionism. Immoderates in these two classifications should be no more than nuisances, because they have no real concern about proper nutrition and because they are vulnerable to direct exposure. Too frequently exposure is not forthcoming and they attract naive and misguided adherents. If these adherents include a few physicians, dentists, educators or public health workers, they then become brazenly resistant to nutritional truths.

Most immoderates, on the other hand, have a very real and intense interest in foods and in nutritional health. Some of these are in the zealot class. They have allowed themselves to be discouraged unnecessarily by the failure of modern nutritional science to have cured quickly the world's ills and, in their disillusionment, have espoused a cause that virtually denies the findings of scientific investigations. Some are in the fanatic class. They believe that there can be no duplication in the chemist's laboratory of the subtle vital nature of an indispensable nutrient. Thiamine in yeast has a mysterious power, they insist, a power that cannot possibly be shared by an ordinary-appearing, man-made synthetic powder, even though that powder represents one of man's greatest achievements, even though that powder functions as a chemical compound in the body according to an orderly scheme that is as fantastically awe-inspiring as is the universe.

The lack of appreciation and of understanding of the true chemical nature of foodstuffs and of body processes is the principal reason for the immoderation of the great majority of extremists who are neither calloused hypocrites nor zealots nor fanatics but are individuals whose sincere interest and ignorance drive them doggedly to unreasonable measures to achieve nutritional health. Even so, this is not the whole story. It is not common for men and women to choose deliberately that which is unreasonable. The answer is, of course, that their beliefs appear reasonable to them.

A man's own idea of his reasonableness in his attitudes about nutrition depends on his experience, his knowledge, his judgment and his interpretation of existing data. If available facts about foodstuffs and about their assimilation in the body are not items of general knowledge how can the public arrive at reasonable decisions? If the facts have not yet been demonstrated by competent investigators, then, indeed, confusion is piled on confusion. It is not surprising that char-

latans thrive under these circumstances, and that the well-intentioned are led astray.

How can man extricate himself from the dilemma of misunderstanding and dispute about the food he eats? This is a phase of the age-old conflict between truth and ignorance, between moderation and immoderation, between reason and conjecture. He must, at least, make certain that he is not immoderate in his estimation of his own moderation. Has the dental profession aggravated the problem by making the extremists more susceptible to misinformation and to erroneous propaganda? Has it weakened the cause by an earlier misplaced optimism that dental caries, for example, would be as easily eradicated by proper diet as is beriberi by the proper use of thiamine and of thiamine-containing foods? Are members of the profession overly scornful of immoderation because they are inwardly resentful of its successful appeal for many in the community? Are they too sensitive about association with quackery or with reckless misrepresentation of facts to admit that the sincere immoderate also wants a first class diet? Is the dentist afraid to say, "I don't know" when this is the right answer, merely because an immoderate of the blatant, exhibitionist category insists falsely that he does know? Have the members of the dental profession really made a serious attempt to inspire confidence in themselves as exponents of nutritional science by a forthright presentation of what is known and by an equally forthright admission of what is not known?

This idea can be illustrated best by the consideration of the nutritional value of foodstuffs grown on soils fertilized by other than so-called "natural or organic fertilizers" and by reference to certain other aspects of modern nutritional science. This is not an attack on the value of "organic fertilizer." What is attacked and attacked vigorously is the idea that "organic fertilizer" is something more than a mixture of chemicals, and that it cannot be duplicated by the manufacturing chemist. Here, in new guise is the old idea that natural products may be subject to analysis but not to synthesis. This was the doctrine demolished more than a century ago by Wöhler's synthesis of urea. Is it not in accord with modern science to believe that "organic fertilizer" will in time be duplicated or even surpassed by a cheaper combination of chemical compounds with or without added soil bacteria? If duplication is not yet possible, should this fact not be a spur to greater expenditures for soil research? In the meantime, agricultural experts, chemists and food technologists are well-advised to make all possible use of reasonable methods of increasing crops and food products if the world's growing population is to survive.

## NUTRITIVE CHARACTERISTICS OF PLANTS

What are the facts regarding soils, fertilizers and nutritive characteristics of plants? The species or variety determines the inherent chemical composition of a plant. It will have this normal composition in a favorable environment if the soil is complete. In wholly normal plants there is a great variation in composition that is related to the age of the plant. In part, at least, this variation is dependent on the leafiness of the plant, on the relative proportion of leaf and stem. Younger plants contain more protein and are more digestible. These changes and others are significant for the food value of the plant and are independent of the soil, provided the latter is adequate for growth.

The addition of extra elements will have little or no effect on the plant except in unusual circumstances such as the presence of selenium in the soil. Selenium is used by the plant in place of the element, sulfur, which it closely re-

sembles. Toxic effects occur in animals foraging on vegetation in a seleniferous area. The presence of injurious levels of selenium in soils is not a man-made phenomenon. Here is an example of a bad plant from bad soil, affecting adversely herbivorous and omnivorous animals in the locality.[6]

Soil can be bad also because of a deficiency of an essential element or because of an imbalance that has the effect of a deficiency. In these instances, plant deficiencies may be expected. In turn, animal deficiencies may result, but only if there is limitation of the food intake to the deficient foodstuffs in question.[7]

The demonstration of an unexplained nutritional incident in man or in animals is disturbing, not only because mankind optimistically looks forward to the time when his knowledge of foods will be complete, but also because the temporary lack of understanding is used by some extremists as additional ammunition in attacks on reasonableness in nutritional practice. Some of these incidents will be considered.

## UNEXPLAINED NUTRITIONAL INCIDENTS

The prominence of magnesium in the skeletal structures of the body, the activating role of the magnesium ion in certain enzymatic reactions of animal tissues, and the demonstrated evidences of injury in many animal species fed magnesium-deficient diets[8,9] are presumptive indications of its essential character in all animals, including man. The characteristics of a syndrome in man, unequivocally proved to be due to a dietary lack of magnesium are, however, not known. That this problem is complicated by other factors than the supply of magnesium itself is evident from the findings in connection with the occurrence of "grass tetany" in cattle.[10,11] This condition is definitely related to a low blood level of the mineral, but its occurrence in cattle turned out to pasture after a period of stall feeding on hay, grain and silage, even though the pasture herbage may not be unusually low in magnesium, suggests that dysfunction rather than an outright deficiency of magnesium is involved. What the complicating factors are is not known, but there is certainly no comfort in these observations for the believer in the infallible effectiveness of raw, natural and unprocessed food. Nor is there any support for an explanation of grass tetany on the basis of prior exposure of cattle to chemicals added to foodstuffs or to chemicals finding their way into forage through the use of chemical fertilizers. The only chemical known to be of significance in this connection is magnesium, and the simple addition of its salts is effective. The participation of other nutrients is possible, and there need be no hesitation in admitting ignorance of which nutrients or of how they affect the magnesium requirement. The scientific explanation must await more research, and the practical and temporary solution depends on a wider choice of foodstuffs shown by experience and by experiment to be useful components of an adequate dietary.

The circumstances of the molybdenum requirement of plants and animals and of the effect of this element on the requirement of copper constitute a telling argument against the hypothesis that natural foodstuffs are *a priori* richest in food values. Although final answers to the puzzling situation are not yet possi-

6. Moxon, A. L., and Rhian, M. Selenium poisoning. Physiol. Rev. 23:305 Oct. 1943.

7. Maynard, L. A. Soils and health; Council on Foods and Nutrition. J.A.M.A. 143:807 July 1, 1950.

8. Kruse, H. D.; Orent, E. R., and McCollum, E. V. Studies on magnesium deficiency in animals. I. Symptomatology resulting from magnesium deprivation. J.Biol. Chem. 96:519 May 1932.

9. Kunkel, H. O., and Pearson, P. B. Magnesium in the nutrition of the rabbit. J. Nutrition 36:457 Dec. 1948.

10. Sjollema, B., and Seekles, L. Ober StÖrungen des mineralen regulations Mechanismus bei Krankheiten des Rindes. Biochem. Ztschr. 229:358, 1930.

11. Bartlett, S., and others. The influence of fertilizer treatment of grassland on the incidence of hypomagnesemia in milking cows. Brit. Vet. J. 110:3 Jan. 1954.

ble, it seems reasonably clear that both are essential trace elements, and that native soils vary greatly in their contents of the two.[12] In particular, copper deficiency is relatively common in sheep and cattle pastured on the herbage of low copper soils, the deficiency signs being especially acute in the spring when the vegetation appears the richest. The deficiency signs include acute, persistent diarrhea, brittleness of bones, osteoporosis and general unkemptness.

In lambs there is an ataxic condition associated with regional degeneration of the myelin of the nervous system and a predisposition to fractures. In certain areas, low in copper, the condition is cured either by administration of copper salts directly to the animal or by improving the copper content of the animal's food by enriching the soil with copper. This is only part of the story, however, for similar evidences of copper deficiency are frequent in areas in which the copper content of the soil appears normal. In these instances, extra molybdenum in the soil and herbage increases the copper requirement. Again, as in simple copper lack, the molybdenum effect can be overcome by extra copper. This whole problem emphasizes on the one hand the difficulty of assessing food values without supporting chemical analyses with biological observations and, on the other hand, the fallaciousness of the idea that reliance on nature's products is invariably a sure road to nutritional happiness.

The puzzle of the role of molybdenum in the plant world is now in the process of being unraveled.[13] Because molybdenum directly or indirectly influences the availability of copper and other metals in the nutrition of plants, animals using these plants as food may be affected in various ways by the molybdenum content of the soil. The quantity of a plant crop is, of course, a matter of prime importance in a world seeking additional food. The quality also is affected, and a significant decrease in the ascorbic acid content of molybdenum-deficient plants has been reported. Other minerals are doubtless involved in these interrelationships. Zinc, for example, is an indispensable trace element, but excesses which cause anemia and subnormal growth in experimental animals are offset by copper and by liver extracts.[14] It is significant that the condition in lambs known as "enzootic ataxia" in Australia and as "swayback" in Great Britain is prevented by copper. Soil analyses permit the suggestion that the cause is a simple copper deficiency in parts, at least, of Australia whereas the copper lack in Great Britain may be induced by greater zinc concentrations. At any rate, the natural world affords numerous pertinent illustrations of soil imbalances and of outright deficiencies which can be corrected by intelligent application of research findings. The wider dissemination of some of these facts might well correct the erroneous presumption that soils cannot be maintained or cannot be improved by chemical fertilizers. The need of a copper-deficient soil is for copper and not for "organic fertilizer," unless the latter happens to be rich in this element. Here, again, is emphasized the great value of research and of the practical application of research results. Here, again, is emphasized the benefit of a wider choice of those foodstuffs shown by experience and by experiment to be useful components of the daily ration as the best possible protection against nutritional disease.

Especially pertinent are the observations of Shaw and Sognnaes[15, 16] on the relation of diet to caries in experimental

12. McElroy, W. D., and Glass, B. A symposium on copper metabolism. Baltimore, Johns Hopkins Press, 1950, p. 216, 230 and 246.

13. Purvis, E. R. Minor elements in plant nutrition. A review of the role of molybdenum in soils and plants. J. Agri. Food Chem. 3:666 Aug. 1955.

14. Smith, S. E., and Larsen, E. J. Zinc toxicity in rats. Antagonistic effects of copper and liver. J. Biol. Chem. 163:29 April 1946.

15. Sognnaes, R. F., and Shaw, J. H. Experimental rat caries. IV. Effect of a natural salt mixture on the caries-conduciveness of an otherwise purified diet. J. Nutrition 53:195 June 1954.

animals. Although not questioning the benefit accruing from the use of fluoridated water, these workers, along with others, recognize that fluoride deficiency is not the primary cause of dental caries. In the unhappy event there is an enthusiast among the orthodox nutritionists who assumes that all is known about food essentials, real food for thought is found in Shaw and Sognnaes' comparison of a salt mixture of purified chemicals with a salt mixture which was, in fact, the ash obtained by the combustion of a commercial animal diet composed in part of natural foodstuffs. Incorporation of these two salt mixtures in two otherwise identical "purified" diets and the feeding of the two diets to rats to determine incidence of caries yielded 1.4 carious lesions per rat in the case of the "ash" salt mixture in contrast to 6.2 lesions per animal in the case of the supposedly complete "reagent" salt mixture. Noteworthy is the fact that the protective effect of the "ash" was evident in a diet containing 67 per cent sucrose. Also striking was the observation that 21 lesions per rat appeared in desalivated animals, regardless of the salt mixture used.

Obviously, the reason for the superiority of the "ash" salt mixture lies in the presence of unidentified trace elements or in peculiarly potent distribution ratios among the elements known to be indispensable. Recent findings[17] on the essential role of molybdenum in animals, and the suggested influence of vanadium[18] on the integrity of the tooth are suggestive in this connection. Whatever the explanation may be, it is not known. As in the previous citations, the scientific understanding of the superiority of the "ash" salt mixture depends on more research. If these findings are to be applied immediately to human nutrition, a practical and temporary solution requires the incorporation in the dietary of a wider choice of those foodstuffs shown by experience and by experiment to be useful components of the daily ration. Certainly, the observations of Shaw and Sognnaes cannot be construed as support for the supplementation of the diet with ashed preparations of foodstuffs rather than with the foodstuffs in question.

## FOOD PROCESSING

Space does not permit a detailed discussion of food processing and of its alleged irreparable damage to nutrients. There is no intention, however, of evading comment on this subject. Acceptable published evidence shows that minor losses of nutrients occur during the canning of fruits and vegetables. These losses are known and are subject to simple compensation by slight modifications of the dietary. Even this is usually unnecessary. The canning process results in a product free of microorganisms; one that may be transported long distances and stored without refrigeration from one growing season to another. It has increased enormously the supply of nutritious food. If mankind in urban civilization were to limit his consumption of fruits and vegetables to fresh produce as it comes on the market at intervals throughout the year, only a fraction could be used as compared with the total made available by processing. This is an instance in which it is extremely difficult to view the attitude of the extremist with sympathetic understanding. It is a strange and thoughtless conceit, indeed, that leads these immoderates to argue against the use of canned fruits and vegetables in human dietaries.

Incredible also in the light of human experience is the denial of an over-all

16. Shaw, J. H., and Sognnaes, R. F. Experimental rat caries. V. Effect of fluorine on the caries-conduciveness of a purified ration. J. Nutrition 53:207 June 1954.

17. Richert, D. A., and Westerfeld, W. W. Isolation and identification of the xanthine oxidase factor as molybdenum. J. Biol. Chem. 203:915 Aug. 1953.

18. Geyer, C. F. Vanadium, a caries-inhibiting trace element in the syrian hamster. (Abst.) J. D. Res. 32:590 Oct. 1953.

advantage from pasteurization of milk. This processing procedure minimizes the hazards of milk-borne infectious diseases. The loss of part of the ascorbic acid of milk is truly insignificant in view of the plentiful supply of the vitamin in citrus fruits, tomatoes and other fruits and vegetables. The claim of Pottenger[19] that pasteurization results in other damages has not been confirmed.[20]

Much has been said and written about whole grain, white and enriched flours. The problems of production, of storage, of nutritional value and of acceptability of flours have been given careful attention by responsible representatives of the farmers, the processors, the consumers and the public health workers. It has been their considered judgment that enriched white flour is a nutritious and highly acceptable foodstuff. It is certain that a different decision will be made if at any time there is evidence of malnutrition attributable to its use. Some persons prefer the taste of whole wheat bread. This preference, however, is not a basis for discrediting the enriched white product. The two are not identical, to be sure, but the differences are small and become of little significance in a properly diversified diet.

With respect to refined sugars such as sucrose, it may be said with emphasis that the excessive use of "empty calories" in the dietary has no justification. Furthermore, sucrose is a fermentable sugar and such sugars are converted into decalcifying acids by oral bacteria. Starch, also, is converted into a fermentable sugar by salivary amylase and it may be a potential source of acids, especially if starchy food is packed in fissures or between teeth. An impressive array of experimental evidence now indicates that the texture of the food and the duration of the holding period in the mouth, as well as the chemical nature of the dietary carbohydrate, are important in caries-conduciveness in experimental animals. Is it not sensible to advocate a positive program of emphasis on foods rich in nutrients, of emphasis on preventive measures of demonstrated effectiveness, such as fluoridation of drinking water, and of emphasis on nutritional research that will point out the way to caries-resistant teeth?

## OTHER FORMS OF IMMODERATION

Mention only can be made of other forms of immoderation which are of quite bizarre types. Usually these are indications of exhibitionism, desire of self-punishment, or similar manifestations of unusual emotional behavior. Always ignorance is involved, although in some instances it seems as if a sardonic and perverse Old Nick were at work. Some immoderates would spare the digestive enzymes by limiting each meal to one only of the three major foodstuffs, starch, fat or protein. Some would bolster their self-esteem by subjecting themselves to pounds of blackstrap, others to quarts of onion juice. Some struggle valiantly to down a daily, and expensive, blunderbuss charge of a little or a lot of everything, nutrients and pseudonutrients plus essences of seaweed and of royal jelly. And so it goes, anything as long as it is different. Surely immoderation takes peculiar forms.

It was stated at the beginning that unreasonableness in dietary matters interferes with the attainment of nutritional goals. This is reaffirmed. The statement applies to the extremist and also unfortunately, to the public. No simple remedy will apply to all kinds of food intemperance. There can be no dispute with the right of any individual to select his own dietary, as long as he does not become a public nuisance or public charge be-

19. Pottenger, F. M., Jr., and Simonsen, D. G. Heat labile factors necessary for the proper growth and development of cats. J. Lab. & Clin. Med. 25:238 Dec. 1939.

20. Bixby, J. N., and others. Factors affecting the nutritive value of cow's milk. J. Agri. Food Chem. 2:978 Sept. 1954.

cause of malnutrition. Certainly, the disciples of raw food are entitled to raw food as long as they can afford this type of impractical luxury.

One thing that scientists must not do is to deny belief in the experimental method. Regardless of a desire to gain a worthwhile goal quickly, regardless of public demand, regardless of the apparent popularity of silver-tongued extremists, members of the health professions must never give the public the idea that there is nutritional benefit in any procedure for which there is no experimental support, only wishful thinking. This can be most frustrating because of the many gaps in knowledge, but in the long run, the health worker will have gained the confidence of the public. No one knows the amount of ill health that has resulted from the many types of food restrictions and food excesses. Certainly, as scientists, the dentists must watch carefully any recommendations lest they find themselves in the same miserable category as the advocates of false cancer cures.

COMMENT

In conclusion, a few points may be stressed. There is nothing in nutritional history that should persuade the dentists to give up reasonableness and moderation. Knowledge of foods is far from complete, but a tremendous background of experience has been accumulated which can direct the profession where experiment has not shown the way. The main concern should be three-fold, to encourage and support research on soils, on foods and on the relation of food to health, to adopt and practice a vigorous, positive, factual program of education concerning the know-how of good nutrition, and, above all, to be judicious and accurate in the evaluation and interpretation of dietary findings.

*6617 Louise*

# Oral manifestations of systemic disease, including those due to nutritional deficiencies

*Seymour J. Kreshover, D.D.S., M.D., Ph.D., Richmond, Va.*

The great advances made in the field of nutrition and the wide horizons yet to be explored are exemplified by the voluminous literature that has been assembled to date and by the increasing research activity.

Unfortunately, an inherent evil in any area receiving so much attention is the abuse, misuse and misinterpretation of knowledge, and the pose of authority assumed by so many unqualified persons. These factors are largely responsible for the generally accepted idea that nutrition is a simple matter of adequacy or inadequacy of diet that can be readily regulated by formula. Certainly, the dangers incidental to practices of the uninformed,

Presented as part of a panel discussion, "Nutrition and Oral Health—Facts and Fallacies," before the Sections on Research, Public Health and Periodontics, ninety-sixth annual session, American Dental Association, San Francisco, October 18, 1955.

Professor of oral pathology and director of dental research, Medical College of Virginia, School of Dentistry.

whether they be pseudotherapist or unguarded subject, should be called to the attention of the public, and strenuous efforts made by the organized health professions to end the widespread sense of apathy and false security that exists today.

Undoubtedly contributing to the many misconceptions about nutrition is the overemphasis placed on vitamins as an essential requirement. This overemphasis may stem from the fact that the discovery of vitamins gave great impetus to the recognition of deficiency states as a vitally important aspect of medicine and dentistry; however, the practitioner should be mindful of other categories of malnutrition, whether they be in calories, proteins, amino acids or minerals. He should be aware of the fact that deficiency diseases can be attributed not only to inadequate diet but to organic disease.

In light of the many erroneous concepts of nutrition and preparatory to any consideration of deficiency diseases, some clarification of terminology is indicated. Nutritional inadequacies obviously may result from either a decreased dietary intake of nutrients or from some conditioning factor or organic disorder that increases demand for one or more of the essential foodstuffs. Among the so-called conditioning factors are impaired absorption and excessive loss or increased requirement of nutrients. As an example, pernicious anemia is associated with an atrophy of the gastric mucosa, achlorhydria and deficiency of an "intrinsic" factor present in the gastric secretions.[1] Inasmuch as this unidentified substance is essential for the absorption of an "extrinsic" factor present in various foods, a deficiency results which is manifested by abnormal erythropoiesis. A somewhat similar absorptive defect, though achlorhydria is not exhibited, is seen in sprue.[2]

Other conditions such as diarrhea, polyuria and hyperthyroidism may be said to predispose to nutritional deficiencies by reason of the increased demand for essential nutrients. Although these pathologic states provide a vivid example of conditioning factors, a variety of physiologic changes during growth, pregnancy and lactation can initiate comparable nutritional inadequacies.[3] It is seen, therefore, that in treatment of nutritional deficiency, a determination of cause is of first importance. Obviously, a situation that merely demands an increased supplement of essential nutrients is quite a different matter from one that calls for initial correction of an underlying organic disease.

Pertinent to the general subject of nutrition is the fact that, unlike the greater part of the world population where deficiency diseases exist as a primary result of an inadequate food supply, physicians and dentists in the United States are most frequently confronted with deficiencies in those individuals who have been ill advised regarding their dietary regimes and in those patients who have either psychologic and emotional difficulties, organic disease of the gastrointestinal tract, or heart and kidney disorders which induce anorexia, nausea and vomiting.[4]

Whether undernutrition stems from a faulty food intake or abnormal digestion, absorption or utilization, it almost invariably will involve a deficiency of more than one essential nutrient. Further complicating the picture are those basic differences in requirement of calories, amino acids, minerals and vitamins as they are influenced by occupation, sex, age and other physiologic processes. Thus, most of the syndromes seen by the

1. Strauss, M. B. The role of the gastro-intestinal tract in conditioning deficiency disease. J.A.M.A. 103:1 July 7, 1934.

2. Hurst, A. The pathogenesis of the Sprue syndrome. Guy's Hosp. Rep. 91:1, 1942.

3. Macy, I. G., and others. Physiological adaptation and nutritional status during and after pregnancy. J. Nutrition 52: Supp. 1 April, 1954.

4. Thorn, G. W. Undernutrition. In Principles of internal medicine, ed. 2. Harrison, T. R., editor. New York, The Blakiston Division, McGraw-Hill Book Co., Inc., 1954, p. 555.

medical or dental practitioner represent multiple rather than single deficiencies. As such diseases develop, functional disturbances occur in many parts of the body and contribute to a complex clinical picture presenting a great variety of signs and symptoms. Such rather diffuse and vague manifestations as loss of weight, burning sensations of the skin, mucous membranes and eyes, and a variety of central nervous system disturbances may be present for months or even years before characteristic lesions appear. A further complication is that these lesions most often predominantly reflect but one or two of the lacking essential factors, and even then may often be simulated by lesions of nonnutritional origin. Therefore, to neglect a careful medical evaluation and to furnish patients merely with the particular nutrient that appears to be indequately supplied, could be a most serious matter. Obviously, the treatment should be directed toward those conditions that brought about the deficiency.

Equally important is the responsibility of the practitioner to caution patients regarding the practice of self-medication so widely encouraged by advertising, the ready accessibility of vitamin and other high-potency preparations over drugstore counters, and the false teachings of food faddists. The average person, not suffering from organic disease and free of other conditioning influences, can meet his nutritional requirements easily by ingestion of a variety of readily available foods. The widespread practice of massive vitamin supplementation by the American public, however, is a subject of increasing concern. In addition to creating a neglect, as well as carelessness in the selection, of other essential foods and a consequent danger of amino acid or mineral deficiencies, such over-medication may also initiate toxicity. Although still relatively uncommon, the excessive intake of vitamin concentrates and high-potency fish liver oils can bring about a syndrome of hypervitaminosis A, characterized by an enlarged liver and spleen, leukopenia, anemia and periosteal changes.[5] Similarly, the prolonged ingestion of excessive amounts of vitamin D can produce, in both infants and adults, a syndrome manifested by anorexia, nausea, vomiting, diarrhea, muscular weakness, headache, drowsiness and weight loss. Oftentimes, albuminuria, elevated nonprotein nitrogen, increased serum calcium, and roentgenologic studies indicate kidney damage, osteoporosis and metastatic calcification of periarticular structures.[6,7] Such effects make it increasingly important that hypervitaminosis D be suspected in all instances of hypercalcemia. Thus, another disease entity may be included in the differential diagnostic procedures in which heretofore only such conditions as hyperparathyroidism, multiple myeloma and skeletal neoplasms were considered.

In a consideration of oral manifestations of deficiency diseases, the multiplicity of systemic dysfunctions contributing to the clinical features warrants re-emphasis. For example, although deficiencies in specific amino acids may complicate the picture of severe malnutrition, the very presence of multiple other deficiencies makes it impossible to distinguish a syndrome caused by a particular amino acid lack. Further difficulties are presented by the similarity of signs and symptoms resulting from different essential food deficiences as well as nonnutritional disturbances. Although specific regional manifestations of systemic disease, whether oral, cutaneous, osseous or vascular, may be suggestive in themselves, diagnosis invariably depends on a consideration of the entire organism. Inas-

5. Gribetz, D.; Silverman, S. H., and Sobel, A. E. Vitamin A poisoning. Pediatrics 7:372 March 1951.

6. Bauer, J. M. and Freyberg, R. H. Vitamin D intoxication with metastatic calcification. J.A.M.A. 130:1208 April 27, 1946.

7. Danowski, T. S.; Winkler, A. W., and Peters, J. P. Tissue calcification and renal failure produced by massive dose vitamin D therapy of arthritis. Ann. Int. Med. 23:22 July 1945.

much as few disease entities have localized manifestations that are truly pathognomonic, it may be dogmatically stated that for every soft tissue lesion found in the oral cavity, a number of local or systemic factors may be responsible.

Unfortunately, many dental and medical practitioners are overly impressed by the seemingly remarkable ability of some clinicians, essayists and authors to make diagnoses merely by examining an isolated lesion in or about the mouth. Too often the expert fails to mention the essential part played by consultants and laboratory technicians in providing the correct diagnosis. Nevertheless, the dental practitioner is in an excellent position to observe, suspect and refer; but he should be ever mindful that the mere presence of a lesion in a particular organ or tissue site does not necessarily qualify the specialist in that anatomic area to reach a diagnosis unaided or to carry out treatment.

Although no data can be presented that would give the relative incidence of oral lesions specifically related to nutritional disorders as compared to those reflecting other systemic diseases, the current vogue of prescribing vitamins and other dietary supplements for so many conditions seen in the mouth contributes, unquestionably, to an exaggerated impression of incidence. Many illustrations may be cited of lesions of the mouth that may or may not be related to nutritional deficiencies. Papillary atrophy of the tongue, for example, may be associated not only with vitamin B complex deficiency but also with pernicious anemia, Plummer-Vinson syndrome and various other conditions exhibiting gastric hypoacidity. Likewise, similar gingival lesions may reflect a leukemia, gonadal hormone dysfunction, allergic reaction or nutritional inadequacy. It is apparent, therefore, that in addition to oral manifestations of disturbed nutrition and various diseases of local origin, the mouth may give evidence of many systemic disorders. These include metallic poisoning, infections, and disturbances of fluid balance, erythropoiesis, metabolism and the endocrines. On the other hand, although many acute gingival and other stomatologic disorders may be nutritional in origin, the possibility exists that they themselves may be the initial, exciting causes of a poor dietary intake. Obviously, the dentist who is so presumptuous as to make a diagnosis of nutritional deficiency without benefit of proper consultation or referral for a complete medical examination is rendering a disservice to his patient.

It may be said in conclusion that although the subject of oral manifestations of nutritional deficiencies may oftentimes "steal the show" from such less glamorous subjects as a carious lesion or a periodontal pocket, the actual incidence of such lesions is probably much less than commonly thought. Nevertheless, they are a challenge to the dental practitioner to follow a proper course of caution, conservatism and consultation. Any other action can readily provide the initial step in a sequence of pitfalls culminating in the acceptance of high-potency and other dietary supplements as a panacea in medical and dental practice.

*Transmission of Knowledge* • Neither chemistry nor science as a whole advances only through great discoveries. The teaching of science—the handing on of new knowledge, its understanding simplified by the formulation of unifying theories and the removal of errors and unnecessary details—is no less important. *Endeavor, July 1955, p. 116.*

# The role of nutritional therapy in the management of periodontal disease

*Irving Glickman, D.M.D., Boston*

The oral manifestations of nutritional deficiencies have been abundantly documented in the literature.[1] This paper will deal specifically with the application of nutritional therapy in the management of periodontal disease. The treatment of disease in other areas of the oral cavity and in adjacent structures is not within the scope of this presentation.

The vagueness in the literature regarding nutritional therapy for the management of periodontal problems reflects the absence of definitive information on the subject. Inconclusive and inadequately controlled clinical reports frustrate those who seek guidance in the use of nutritional therapy for specific periodontal problems. The numerous articles written for the purpose of explaining how the dentist may enhance his treatment of periodontal disease through the benefits of nutritional therapy generally consist of an introduction replete with platitudes on the importance of nutrition, some specific suggestions for evaluating the individual nutritional status and tables of recommended daily nutrient allowances. In addition, in too many instances there are reports of uncontrolled treated cases of periodontal disease, with no evidence of a relationship between the nutritional therapy and the eradication of the periodontal ailment.

Such well intentioned presentations, of necessity, adhere to generalities without offering specific information as to the manner in which nutritional therapy can be applied in the treatment of periodontal disease. The reason for this lack is the dearth of carefully controlled clinical evidence that is required to provide the information. In the following analysis of the role of nutritional therapy in the management of periodontal disease, the most that will be attempted is a translation of theoretical considerations into clinical reality. The factual basis of present knowledge and clinical experience will be adhered to as much as possible, and the pitfall of being overwhelmed by the vehemence and dogma of the faddist will be avoided.

It has been demonstrated in numerous animal experiments[2] that systemic disturbances are capable of inducing destructive changes in the underlying tissues of the periodontium. Interpretation of the findings is subject to the qualifying limitations inherent in the application of animal studies to disease as it occurs in human beings. Nevertheless, the observations made in such studies are helpful to the operator who seeks an explanation for the occurrence of chronic destructive

Presented as part of a panel discussion, "Nutrition and Oral Health — Facts and Fallacies," before the Sections on Research, Public Health and Periodontics, ninety-sixth annual session, American Dental Association, San Francisco, October 18, 1955.

Professor of oral pathology and periodontology and director of the division of graduate and postgraduate studies, Tufts University School of Dental Medicine.

1. Glickman, I. Clinical periodontology. Philadelphia, W. B. Saunders Co., 1953, p. 407-438.

2. Glickman, I. Experimental basis of the "bone factor" concept in periodontal disease. J. Periodont. 20:7 Jan. 1949.

periodontal disease in a patient in whom the local factors are insufficient to explain the extensive tissue destruction. Nutritional deficiencies are prominent among the systemic factors capable of inducing destructive changes in the periodontium. The possibility exists that inadequacy in the ingestion or utilization of vitamin C,[3, 4] vitamin D,[5, 6] calcium[5] and phosphorus[7] may be contributory causative factors when extensive destruction of periodontal membrane and alveolar bone occur in association with relatively moderate gingival inflammation or pocket formation.

There are extremely few who take exception to the idea that nutritional deficiencies are capable of inducing disturbances in the periodontal tissues. This is a broad generalization, however, which is of little practical value in the clinical management of specific periodontal problems. No one will deny that patients suffering from malnutrition should receive the benefits of nutritional therapy, but this does not justify the assumption that the systemic nutritional status is contributing to the periodontal disease or that the condition of the periodontium will improve, or its response to local treatment will benefit by, the correction of the nutritional deficiency.

If nutritional therapy is to become a dependable effective part of periodontal treatment, the "possibility" must be distinguished from the "reality" in every case in which a nutritional causative factor is suspected. A distinction must be made between "nutritional guidance" with its potential for general improvement in the individual's nutritional status and "nutritional therapy" to fulfill specific needs indicated by the patient's periodontal condition.

## APPROACH TO NUTRITIONAL THERAPY

One approach to nutritional therapy is to require all patients, with or without periodontal disease, to prepare a detailed diary of food intake, usually to cover seven days. The nature of the dietary deficiencies is established by comparing the food diary with *Recommended Dietary Allowances*[8] or by more comprehensive methods.[9] After systemic factors which could cause a conditioned nutritional deficiency are ruled out, an appropriate dietary regime is prescribed. Little fault can be found with this procedure as long as both the dentist and patient appreciate that it really is "nutritional guidance" and not "nutritional therapy" for the patient's periodontal condition. The patient's over-all nutritional status undoubtedly will benefit from such guidance, and it offers the attractive feature of being equally applicable to all patients. For the patient without periodontal disease, it may be presumed to be a preventive against the onset of deficiency-induced oral changes; however, for the patient with periodontal disease its usefulness is somewhat ephemeral. Because no attempt is made to determine in each instance whether or how nutritional deficiency has influenced the periodontal condition, the nature of the effect, if any, of the prescribed diet on the periodontium cannot be determined. Such nutritional guidance would be harmful to the patient with periodontal disease if it misled the operator into believing the pa-

3. Boyle, P. E.; Bessey, O. A., and Wolbeck, S. B. Experimental alveolar bone atrophy produced by ascorbic acid deficiency and its relation to pyorrhea alveolaris. Proc. Soc. Exper. Biol. & Med. 36:733 June 1937.

4. Boyle, P. E.; Bessey, O. A., and Wolbeck, S. B. Experimental production of diffuse alveolar bone atrophy type of periodontal disease by diets deficient in ascorbic acid (vitamin C). J.A.D.A. & D. Cosmos 24: 1768 Nov. 1937.

5. Becks, H., and Weber, M. Influences of diet in bone system with special reference to alveolar process and labyrinthine capsule. J.A.D.A. 18:197 Feb. 1931.

6. Weinmann, J. P., and Schour, I. Experimental studies in calcification. II. Effect of a rachitogenic diet on the alveolar bone of the white rat. Am. J. Path. 21:833 Sept. 1945.

7. Arnim, S. S., and others. Dental changes in rats consuming diet poor in organic salts. Yale J. Biol. & Med. 9:117 Oct. 1936.

8. Recommended dietary allowances. Washington, D.C., National Research Council Reprint and Circular Series No. 129, Oct. 1948.

9. McLester, J. S., and Darby, W. J. Nutrition and diet in health and disease, ed. 6. Philadelphia, W. B. Saunders Co., 1952.

tient's periodontal condition was being treated and caused him to diminish the thoroughness of the local treatment which the patient's condition really required.

From the periodontal viewpoint, the crux of the problem of nutritional therapy lies in the extent to which the condition of the periodontium can be attributed to the existent nutritional deficiency. This requires thorough analysis of the nature of the disease of the periodontium plus an evaluation of the relative importance of local and systemic causative factors. The latter is not a simple task. The degree to which it can be accomplished determines the difference between empirical "nutritional guidance" and specific "nutritional therapy."

If, when examining a patient, the operator finds that the response of the periodontium to existing local factors varies from that which ordinarily would be expected, then he might suspect that contributory systemic factors were involved. Nutritional deficiency is one of many systemic conditions which may distort the response of the periodontium to local factors.

To determine whether nutritional deficiency is a contributing factor in the causation of the patient's periodontal problem, the following procedures are required.

*Evaluation of the Patient's Systemic Nutritional Status* • Evaluation of the patient's systemic nutritional status is based on the medical and dietary history (food diary for a seven day period), general physical examination, including the oral cavity, and pertinent biochemical tests. The diary of food intake is important, but ultimately the patient's nutritional status must be measured in terms of clinically detectable tissue changes rather than by standards in a table of recommended daily food allowances. The medical history and general physical examination point to systemic conditions which could be responsible for creating a conditioned nutritional deficiency, as well as reveal any overt signs of malnutrition.

*Analysis of the Nature of the Disease of the Periodontium Combined with Evaluation of the Relative Importance of Local and Systemic Causative Factors* • Chronic gingivitis is the most common periodontal problem. It is characterized by changes in color, size, shape, consistency and texture of the gingiva, with varying degrees of bleeding when the gingiva is stimulated mechanically. In every case of chronic gingivitis there is some form of local irritation, mechanical, chemical or bacterial, in varied combination. There are no nutritional deficiencies which of themselves cause chronic inflammation of the gingiva.

The distribution of chronic gingivitis depends on the location of the local irritants. On a morphological basis, the gingiva is divided into the marginal, interproximal and attached zones. Chronic gingivitis generally starts at the gingival margin or the interproximal papillae or both, and involves the attached gingiva only when the gingivitis is extensive.

In chronic gingivitis, the gingiva is also subject to transient variations in color and surface texture caused either by recurrent accumulations of *materia alba* at the margin or by superimposed acute inflammatory reactions. These transient surface changes usually cause an increased redness which may be accompanied by pain or an increased tendency toward bleeding. These manifestations distract the operator's attention from the underlying chronic condition which is the real problem confronting him. Compared with the relatively symptom-free chronic inflammation, such superimposed surface changes are rather dramatic in appearance. There is a tendency to attribute them to some remote cause rather than to the variations in the local environment from which they arise.

On a theoretical basis it is possible that

nutritional deficiency may aggravate the severity of existing chronic marginal gingivitis. It is also possible that local irritation may occur in the mouth of a malnourished patient. In both circumstances the marginal or interproximal papillae or both will present more severe changes than the attached gingiva. This would result from the fact that the marginal or interproximal papillae suffers from the combined effect of local irritation and nutritional deficiency, while the changes in the attached gingiva would be the result of the nutritional deficiency alone.

It is extremely pertinent to point out that local factors are capable of inducing conditioned nutritional deficiencies in the tissues of the periodontium even in patients with satisfactory general nutritional status. It is generally recognized that malnutrition may be (1) primary, resulting from insufficient food intake, or (2) secondary or conditioned, resulting from impairment in the absorption, transportation or utilization of the nutrients, from increased requirements, or from destruction or excretion, even in the presence of adequate food intake. For the most part, the conditioning influences are thought of in terms of systemic factors. However, the chronic inflammation which results from such local factors as calculus, overhanging fillings and food impaction can cause a conditioned nutritional deficiency in the periodontal tissues as follows:

1. The passive circulatory congestion impairs the transportation of nutrients to the tissues and retards the removal of the products of tissue metabolism.

2. The degeneration of cells impairs the utilization of nutrients.

Trauma from occlusion is associated with degenerative changes in the underlying tissues of the periodontium which impair the capacity to utilize available nutrients.

Because gingival inflammation and trauma from occlusion are factors which can lead to a conditioned nutritional deficiency in the periodontal tissues in a well nourished patient, it is a basic clinical principle that these must be eliminated if the periodontal tissues are to benefit from nutritional therapy. For example, vitamins are commonly used as adjunctive therapy for gingival disease. Vitamins do not function as independent nutrients; they participate in enzyme reactions. Inflamed or injured tissue of the periodontium may be so altered as to be incapable of forming substances necessary for effective action of the vitamins. The removal of all harmful local factors is therefore essential before the periodontal tissues can actually benefit from the vitamins administered to the patient.

The stressing of the importance of local irritation as a factor capable of setting up a conditioned nutritional deficiency in tissues of the periodontium does not minimize the possible deleterious effect of the resultant nutritional deficiency. It merely brings out the relative significance of local irritation and nutritional deficiency in the causation of the tissue changes in chronic gingivitis.

A more realistic appreciation of the significance of local irritation in the causation of gingival disease is necessary for the proper evaluation of the role of the more commonly employed nutritional supplements such as the vitamin B complex and vitamin C. The presence of gingivitis and "bleeding gums" are often presumed to indicate the need for ascorbic acid therapy. It is a fact that acute vitamin C deficiency causes the connective tissue of experimental animals to be altered by edema, collagen degeneration and hemorrhage; however, acute vitamin C deficiency of itself does not cause gingivitis.[10] Gingivitis does not occur in vitamin C deficient animals unless a local irritant is present.

10. Glickman, I. Acute vitamin C deficiency and periodontal disease. I. The periodontal tissues of the guinea pig in acute vitamin C deficiency. J. D. Res. 27:9 Feb. 1948.

Clinical studies in human beings have resulted in disagreement between those investigators who report a correlation between the ascorbic acid level of the blood and the incidence and severity of gingival disease[11,12] and others[13-16] who could detect no such relationship. In one study[17] in which previously treated patients were continued on daily supplements of ascorbic acid, the percentage incidence of recurrent gingivitis was less in the group receiving the higher ascorbic acid dosages. No analysis of the local factors or toothbrushing habits in the individual patients was included in the report. A recent comprehensive review[18] of the subject of nutrition and disease calls attention to the fact that treatment of the "characteristic lesions" in the mouth of scorbutic adults "demands the removal of the cause, followed by an adequate diet containing sufficient ascorbic acid." The review also contains the following comment: "We have observed many patients with no ascorbic acid in their plasma but no symptoms of scurvy."

Oral mucous membrane changes, including gingivitis, have been identified with deficiencies in components of the vitamin B complex.[19] Although investigators[20] caution against overlooking local factors in the causation of angular cheilosis, the role of local factors in the etiology of gingivitis associated with vitamin B complex deficiencies has not been critically evaluated. Recently,[21] however, the following statement appeared in the report of a study of the effects of deficiencies in niacin, riboflavin, pyridoxine, folic acid and pantothenic acid in dogs:

> In the earlier works on Vitamin B deficiencies in dogs, the redness of the gingival margin was stressed as being one of the characteristic signs of the deficiency. However, the redness per se is not diagnostic. It has been found in all our dogs fed synthetic diets and in many of those consuming various diets used in the animal house. Observations indicate that the degree of redness (that is, marginal gingivitis) depends primarily upon the amount of local irritation present, namely, upon the amount of calculus and food debris. Although the response of the tissues to irritation can be modified by a deficiency, the lesions are not specific in themselves. In all but two of our dogs the removal of such irritation from the gingival margin followed by toothbrushing was effective in preventing the development of gingivitis. Although this measure failed to achieve a beneficial effect in two dogs, the fact that the teeth of one side only were brushed should be kept in mind.

*Nutritional Therapy in the Management of Periodontal Disease* • The general principles governing the therapy of nutritional deficiency are dealt with in numerous texts.[22,23] These contain detailed discussions of such basic aspects of nutritional therapy as the need for eliminating systemic conditioning factors, the inclusion of all essential nutrients in diets prescribed to correct deficiencies in specific nutrients, the advisability of using polyvitamin therapy rather than attempting to replenish inadequacies of a single vitamin, the relative requirements of acute and chronic nutritional deficiencies and

11. Weisberger, D.; Young, A. P., and Morse, F. W. Study of ascorbic acid blood levels in dental patients. J.D. Res. 17:101 April 1938.

12. Blockley, C. H., and Baenziger, P. E. An investigation into the connection between vitamin C content of the blood and periodontal disturbances. Brit. D.J. 73:57 Aug. 1, 1944.

13. Burrill, D. Y. Relationship of blood plasma vitamin C level to gingival and periodontal disease. J.D. Res. 21:353 Aug. 1942.

14. Crandon, J. H.; Lund, C. C., and Dill, D. B. Experimental human scurvy. New England J. Med. 223: 353 Sept. 5, 1940.

15. Burrill, D. Y. Oral conditions in experimental vitamin C and B deficiency. J.A.D.A. 33:594 May 1946.

16. Delldorf, G., and Zall, C. Tooth growth in experimental scurvy. J. Exper. Med. 52:57 July 1930.

17. Linghorne, W. J., and others. Relation of ascorbic acid intake to gingivitis. J. Canad. D.A. 12:49 Feb. 1946.

18. Spies, T. D., editor. Symposium on nutrition and disease. Postgrad. Med. 17:1 March 1955.

19. Afonsky, D. Collective review: oral aspect of vitamin B complex deficiency. Oral Surg., Oral Med. & Oral Path. 3:1299 Oct. 1950.

20. Mann, A. W.; Dreizen, S., and Spies, T. D. Further studies in the effect of the correction of mechanical factors on angular cheilosis in malnourished edentulous patients. Oral Surg., Oral Med. & Oral Path. 1:868 Sept. 1948.

21. Afonsky, D. Oral lesions in niacin, riboflavin, pyridoxine, folic acid and pantothenic acid deficiencies in adult dogs. Oral Surg., Oral Med. & Oral Path. 8:867 Aug. 1955.

22. Wohl, Michael D. Dietotherapy; clinical application of modern nutrition. Philadelphia, W. B. Saunders Co., 1945.

23. Stern, Frances. Applied dietetics, ed. 3. Baltimore, Williams & Wilkins, 1949.

the difference between maintenance and therapeutic nutrient levels. For present purposes a detailed review of the general principles of nutrition will be omitted and only those aspects will be dealt with which relate specifically to the problem of utilizing nutritional therapy as an aid in the treatment of periodontal disease.

The periodontal problems for which nutritional therapy may be required may be grouped as follows: chronic gingivitis; chronic destructive periodontal disease, and acute gingival disease, particularly acute necrotizing gingivitis. Nutritional therapy may serve the following purposes:

(1) etiotropic: The correction of deficiencies which may be contributing factors in the etiology of the patient's periodontal problem; and (2) supportive: The correction of malnutrition to obtain maximum healing, and the supplementing of a satisfactory diet to meet increased nutritional requirements during posttreatment healing.

*Etiotropic Nutritional Therapy* • After the existence of nutritional deficiency has been established, and careful study indicates that the deficiency may be a contributing factor in the causation of the patient's periodontal disease, nutritional therapy should be undertaken as soon as feasible, without necessarily waiting for the institution of local treatment measures. Under such circumstances, correction of the nutritional deficiency is essential for the restoration of periodontal health.

It must be stressed, however, that the nutritional therapy is only an adjunct to the local treatment. All local irritating factors must be eliminated and occlusal disharmonies corrected to insure utilization of the nutrients by the periodontal tissues. The elimination of gingivitis and periodontal pockets is impossible without removal of local factors, regardless of the excellence of the nutritional therapy.

Even when nutritional deficiency has been identified as a contributing factor in the etiology of a patient's periodontal disease, chronic gingivitis and periodontal pockets can be eliminated by thorough local treatment, without using nutritional therapy. Theoretically, the healing after local treatment under such conditions may be slower and the results obtained may be of short duration. Such clinical practice is not recommended. Reference is made to it merely to orient the operator as to the comparative attainments of local treatment measures and nutritional therapy.

From the periodontal viewpoint it is important to emphasize the necessity of prescribing natural foods with a maximum detergent effect on the gingiva. Animal experiments[24,25] and observations in human beings[26,27] have shown that a diet of soft food can lead to gingivitis and destruction of the underlying tissues despite the fact that the nutrient content of the diet is adequate.[28]

Fastidious oral physiotherapy by the patient is essential for the maintenance of periodontal health once it has been attained by a combination of local treatment and nutritional therapy. Continuation of the recommended dietary regime is necessary in order to avoid recurrence of nutritional deficiency. However, this will not suffice as a preventive against the recurrence of periodontal disease unless it is accompanied by careful attention to the removal of food debris and gingival massage as soon as possible after

24. Burwasser, P., and Hill, T. J. Effect of hard and soft diets on the gingival tissue of dogs. J.D. Res. 18:389 Aug. 1939.

25. Ivy, A. C.; Morgan, J. E., and Ferrell, J. I. Effects of total gastrectomy. Surg., Gynec. & Obst. 53:611 Nov. 1931.

26. Haydak, M. H., and others. Clinical and biochemical study of cow's milk and honey as an essentially exclusive diet for adult humans. Am. J. M. Sc. 207:209 Feb. 1944.

27. Pelzer, R. H. A study of the local oral effect of diet on the periodontal tissues and gingival capillary structures. J.A.D.A. 27:13 Jan. 1940.

28. King, J. D., and Glover, R. E. Relative effects of dietary constituents and other factors upon calculus formation and gingival disease in the ferret. J. Path. & Bact. 57:353 July 1945.

each meal. No effort should be spared in training the patient in the proficient use of the toothbrush for the latter purpose.

*Supportive Nutritional Therapy* • In malnourished patients, nutritional therapy is necessary if optimal healing is to be obtained. It is equally important, however, that attention be given to well nourished patients to prevent nutritional deficiencies which might arise from increased demands for nutrients or altered dietary habits during posttreatment healing. It has been demonstrated in experimental animals that deficiency in proteins, vitamin C, riboflavin and vitamin A impairs wound healing.[29,30] High protein diets, adequate in respect to the afore-mentioned vitamins, improve wound healing in experimental animals by shortening the lag period and hastening the return of the repaired wound to maximal strength.[31]

Although a clear-cut interrelationship between wound healing and nutritional status in man[32] has not been established, the conscientious clinician naturally is anxious to provide his patient with the benefit of knowledge acquired from animal experimentation. The increased tissue activity in healing after periodontal treatments, particularly those involving surgical procedures, could conceivably create an increased demand on the nutritionally adequate patient and lead to a conditioned nutritional deficiency. Therefore, on a theoretical basis, some justification could be made for attempting to aid healing of the periodontium in well nourished patients by providing nutritional supplements to meet increased demands in an effort to avoid secondary nutritional deficiency. In order to establish real clinical value for such supplements, however, it will first be necessary to determine whether the increased tissue activity in healing after minor operative procedures in periodontal treatment is of sufficient magnitude to challenge the nutritional status of a well nourished patient. As yet such evidence is not available.

There is a tendency to think of the treatment of acute necrotizing gingivitis as one phase of the periodontal problem in which there can be little doubt as to the need for vitamin B and vitamin C supplements. Several factors logically could be pointed to in support of such clinical philosophy. First, necrotizing lesions of the gingiva have been described in animals[34-36] deficient in vitamin B components or vitamin C and in human beings with a vitamin B deficiency.[37] Second, difficulty in chewing raw fruits and vegetables when a painful condition such as acute necrotizing gingivitis exists could lead to the selection of a diet inadequate in vitamin B and vitamin C.[38] Because these are water soluble vitamins which require continual replenishment, daily supplements may be required to prevent a nutritional deficiency. Third, there are isolated clinical studies which report fewer recurrences when local treatment of acute necrotizing gingivitis is supplemented with vitamin B[39] or vitamin C.[17]

29. Kobak, M. W., and others. Relation of protein deficiency to experimental wound healing. Surg., Gynec. & Obst. 85:751 Dec. 1947.

30. Locallo, S. O., and others. Tissue protein depletion. I. Factor in wound disruption. Surg., Gynec. & Obst. 86:107 Jan. 1948.

31. Whipple, A. O. The critical latent or lag period in healing of wounds. Ann. Surg. 112:481 Oct. 1940.

32. Pollack, H., and Halpern, S. L. Therapeutic nutrition. Washington, D.C., National Academy of Sciences-National Research Council Publication 234, 1952, p. 18.

33. Pollack, H., and Halpern, S. L. Therapeutic nutrition. Washington, D.C., National Academy of Sciences-National Research Council Publication 234, 1952, p. 30.

34. Becks, H., and Morgan, A. F. Effect of deficiencies of the filtrate fraction of vitamin B complex and of nicotinic acid on teeth and oral structures. J. Periodont. 13:18 Jan. 1942.

35. Topping, N. H., and Fraser, H. F. Mouth lesions associated with dietary deficiencies in monkeys. Pub. Health Rep. 54:416 March 17, 1939.

36. Chapman, O. D., and Harris, A. E. Oral lesions associated with dietary deficiencies in monkeys. J. Infect. Dis. 69:7 July-Aug. 1941.

37. Mann, A. W.; Spies, T. D., and Springer, M. Oral manifestations of vitamin B complex deficiencies. (Abst.) J.D. Res. 20:269 June 1941.

38. Nizel, A. E. Therapeutic nutrition for the periodontal patient. J. Periodont. 26:203 July 1955.

39. King, J. D. Vincent's disease treated with nicotinic acid. Lancet 2:32 July 13, 1940.

When the intake of water soluble vitamins B and C has been severely curtailed because of pain in acute necrotizing gingivitis, nutritional supplements may be indicated, along with local treatment, in order to ward off deficiencies in the afore-mentioned vitamins. Under such circumstances the patient may be started on a standard multivitamin preparation combined with a therapeutic dose of vitamin B and C. The following formula[38] is suggested for the latter:

| | |
|---|---|
| Thiamine | 10 mg. |
| Riboflavin | 10 mg. |
| Niacinamide | 100 mg. |
| Calcium pantothenate | 20 mg. |
| Pyridoxine HCl | 2 mg. |
| Folic acid | 1.5 mg. |
| Ascorbic acid | 300 mg. |
| Vitamin $B_{12}$ | 4 micrograms |

Such vitamins are not indicated for most patients with acute necrotizing gingivitis in whom the pain is of only a few days' duration and impairment in nutritional status is not appreciable.

When vitamins are used, detergent foods containing all necessary nutrients should be prescribed along with an adjusted dosage of pharmaceutical vitamin preparations after the acute symptoms have subsided. The period during which therapeutic levels of vitamin B and C are necessary varies according to the progress in each instance. It is reasonable to expect that the patient may be maintained on a natural food diet containing the recommended daily allowances of nutrients after two months on the therapeutic nutritional regime.

Too much reliance should not be placed on nutritional therapy, nor should treatment failure be blamed on an insufficiency of nutritional supplements. Local procedures constitute the keystone of the treatment of acute necrotizing gingivitis. Treatment should not be confined to alleviation of the acute symptoms and the restoration of health in the acutely involved areas. It also must include the elimination of all pathologic gingival changes, chronic as well as acute, throughout the oral cavity. Treatment of acute gingival disease cannot be considered complete as long as any chronic gingival involvement is still present or any factors, local or systemic, capable of initiating or predisposing to gingival disease persist.

Without depreciating the benefits to be derived from nutritional therapy, when indicated, it can be stated that inadequate thoroughness of local treatment procedures, cessation of treatment because the acute symptoms have subsided without eliminating all chronic disease, and insufficient attention to oral physiotherapy by the patient are the most common causes for the persistent recurrence of acute necrotizing gingivitis. In his quest for the solution of "problem cases" the operator is more likely to succeed if he rechecks for previously undetected subgingival calculus, overhanging fillings or food impaction and reviews the patient's toothbrushing habits, than if he increases the vitamin dosage.

## RECAPITULATION

The results of animal experimentation and clinical studies concerned with the effects of nutritional deficiency on the oral cavity can be summarized as follows: the systemic nutritional status affects the metabolism of the periodontal tissues and thereby may participate in the causation of periodontal disease and also influence the response of the periodontium to local treatment. To envision the periodontium as an autonomous unit of the body which is unaffected by the presence of systemic nutritional deficiencies is an erroneous concept.

It is entirely valid to assume that in all patients at all times the general nutritional status exerts either a favorable or unfavorable influence on the periodontium. This statement can be very misleading, however, unless its implications

are understood properly. Problems of health and disease are evaluated at different levels which vary from the extremes of minute physicochemical interchanges at the level of cellular metabolism to the gross changes detected at the clinical level. It is possible for nutritionally motivated changes to occur at the level of cellular metabolism that are not of sufficient magnitude to be reflected in clinical changes.

Nutritional therapy in the management of periodontal disease is useful when dealing with problems at the clinical level. Therefore, such therapy should be governed by information obtainable from clinical examination of the oral cavity. It is not as yet possible for the clinician to ferret out the nature of basic cellular reactions which occur in the periodontium at a given time. He must rely on overt clinical manifestations that are the result of an aggregate of cellular reactions. The shortcomings of information obtainable from clinical examination are appreciated by the conscientious clinician. In the treatment of periodontal disease, however, he must rely on evidence as it is represented in gross tissue changes rather than by a fanciful hypothesis which encourages therapy for the correction of conditions which may or may not exist.

Appreciation of the extent to which the successful management of periodontal disease is dependent on local treatment procedures does not mean that the existence of systemic nutritional influences is disregarded, nor that the benefits that nutritional therapy can provide are denied. It merely means that a working basis has been evolved for the effective treatment of periodontal disease within the framework of currently available, clinically applicable information.

In the crossfire between exuberant enthusiasts and negativistic critics, the experienced clinician hesitates to take a definite stand regarding the exact extent to which nutritional therapy will ultimately be employed in the treatment of periodontal disease. The vague status of existing knowledge results from an insufficiency of adequately controlled positive clinical evidence, rather than from an accumulation of observations regarding the ineffectiveness of nutritional therapy. To adopt rigid attitudes regarding the eventual role of nutritional therapy in the periodontal field simply because the evidence to support it is not yet available would be short-sighted. The dentist must be mindful of the possibility that future research will provide understanding beyond the scope of present imagination. Controlled clinical studies in the field of applied nutrition must be encouraged and supported.

The interdependence of the nutritional status of the individual and the metabolism of the periodontal tissues makes it difficult to conceive that any form of local treatment could obtain its maximum effectiveness unless the benefits to be derived from nutritional therapy were explored exhaustively. Nevertheless, it is appropriate and necessary that dentists be governed by realistic restraint in their attempts to apply the general principles of nutrition to the treatment of periodontal disease. There is a great difference between providing "nutritional guidance" for the purpose of improving the individual's general nutritional status and "nutritional therapy" intended to remedy specific periodontal conditions, even if the therapy is intended only as an adjunct to local treatment measures.

# Nutrition and the tooth

*Henry M. Leicester, Ph.D., San Francisco*

In any consideration of the effect of nutrition on the tooth, it is necessary to make a sharp distinction between the developing and the fully formed structures. During the formative stage, the tooth is one of the most sensitive organs in the body to systemic influences. This fact becomes even more important when it is remembered that once a defect has been built into a tooth it cannot be repaired, but remains for the entire life of the tooth which often greatly exceeds that of its owner. Therefore it is important that adequate nutritional status be maintained while a tooth is forming, so that the supply of building materials is kept up and that these are furnished to the tooth at the proper time.

Once the tooth has formed and erupted, conditions change sharply. From one of the organs in the body most sensitive to systemic conditions, it becomes one of the least sensitive. Atrophy of the ameloblasts, the cells which lay down the enamel, means that there can be no further metabolic change in that tissue. It is true that the odontoblasts, which lay down the dentin, do not atrophy. They may at any time resume their function and lay down secondary dentin, but this substance is formed in addition to the dentin already present and does not modify the latter.

Since systemic changes can no longer alter enamel or dentin in the erupted tooth, only physicochemical or chemical changes, occurring without participation of enzymes in the tooth, can make any alterations in this organ. Such reactions may be important, however, for the anatomic location of the tooth and its physiological function expose it to many substances which may affect it, especially at the enamel surface.

There are several stages in the development of the tooth. The order in which they occur is fixed, and the proper sequence must be followed if normal structure is to result. In both enamel and dentin, a protein matrix is laid down first, and this is subsequently calcified. The mechanisms which control the various stages differ, but it is obvious that if, for example, an imperfect matrix is formed, the succeeding calcification, however normal, cannot lead to a proper structure. On the other hand, if the matrix is normal but calcification is disturbed, a poorly formed tooth will result.

## NUTRITION AND DEVELOPMENT OF TEETH

The nutritional condition of the individual is very important in all these processes. In studies on animals under extreme conditions of deprivation of one essential nutrient at a time, the effects of nutritional imbalance have been isolated and observed.

Presented as a part of a panel discussion, "Nutrition and Oral Health—Facts and Fads" before the Sections on Research, Public Health and Periodontics, ninety-sixth annual session, San Francisco, October 18, 1955.

Professor of biochemistry, College of Physicians and Surgeons.

It has been clearly shown thereby that a deficiency of vitamin A in the diet results in a disturbance of the keratin matrix of enamel, while a vitamin C deficiency causes a similar disturbance of the collagen matrix of dentin. Lack of vitamin D results in poor calcification, the signs of which are histologically indistinguishable from those produced by a lack of calcium or phosphorus in the diet, or an improper balance of these elements. Deficiency of dietary magnesium can also cause a specific type of hypoplasia. The presence of excess fluoride in the diet interferes with enamel formation, resulting in mottled enamel.

The observation of these various effects in experimental animals is usually clear-cut, because the experiments are designed to show only one effect. In human beings these effects are not so obvious or definite because the deficiencies are seldom as severe as in the animals, and also because a poorly nourished individual is likely to suffer from a number of overlapping deficiencies. Actually, too, the teeth are somewhat less sensitive to some dietary deficiencies than are certain other body organs. Thus, in a person with moderately severe rickets in whom the bones show considerable injury, the teeth may appear nearly normal.[1] If, however, in addition to this nutritional deficiency, some extra stress, such as a long-drawn-out disease, a continued fever, or a severe injury takes place, damage to the teeth may also occur.[2]

The mottling effect of excess fluoride is also somewhat dependent on the nutritional status of the individual. When there is a calcium deficiency in the diet, a lower concentration of fluoride will produce the same amount of mottling as that produced by a larger intake of fluoride in a well-nourished person.[3-5] Deficiency of dietary protein[6] or high dietary fat[7] may also enhance the toxic effect of fluoride.

Thus far the discussion has been concerned with the effects of nutritional imbalance which are obvious, at least on routine histological examination of tooth sections. The well known method of tooth ring analysis of Schour shows what can be deduced about the past history of an individual by examining the structure of his teeth.

Evidence is accumulating, however, that there may be other, more subtle changes in tooth structure which are important to the later health of this organ. Sognnaes[8] has shown that if the mother ingests high quantities of carbohydrates during pregnancy, the offspring will later be more subject to caries resulting from a diet high in sugar than would be true if the mother had received very little carbohydrate when she was pregnant. The mechanism of this effect has not been demonstrated clearly, but there are some studies which indicate slight structural changes in teeth as a result of dietary changes during pregnancy or the period of tooth formation. Some of these changes seem to be related to the subsequent caries history of the tooth.

Several workers have failed to observe clear-cut changes in carbonate, phosphate, calcium, or fluoride content of teeth as a result of high sugar intake during tooth development.[9-11] Such ob-

1. Grahnen, H., and Selander, P. The effect of rickets and spasmophilia on the permanent dentition. I. The effect on the teeth. Odont. revy 5:7, 1954.

2. Sheldon, M.; Bibby, B. G., and Bales, M. S. The relationship between microscopic enamel defects and infantile debilities. J.D. Res. 24:109 April 1945.

3. Shourie, K. L. Calcium: fluorine ratio and acute and chronic fluorine toxicosis and dental caries in hamsters and rats. (Abst.) J.D. Res. 27:732 Dec. 1948.

4. Murray, M. M., and Wilson, D. C. Fluorosis and nutrition in Morocco. Dental studies in relation to environment. Brit. D. J. 84:97 March 5, 1948.

5. Massler, M., and Schour, I. Relation of endemic dental fluorosis to malnutrition. J.A.D.A. 44:156 Feb. 1952.

6. Wadhwani, T. K. Effect of fluorine on the metabolism of nitrogen, calcium, and phosphorus in rats. I, II. Indian J. Physiol. & Allied Sci. 7:23, 1953.

7. Miller, R. F., and Phillips, P. H. The enhancement of the toxicity of sodium fluoride in the rat by high dietary fat. J. Nutrition 56:447 Aug. 1955.

8. Sognnaes, R. F. Effect of ingested sugars and other carbohydrates on the resistance of the teeth to caries. J.A.D.A. 51:270 Sept. 1955.

9. Jenkins, G. N., and Speirs, R. L. An investigation of possible differences between the chemical composition of deciduous teeth calcified before and during the 1939-1945 war. (Abst.) J.D. Res. 33:736 Oct. 1954.

servations were usually made when histological methods of study were used. On the other hand, chemical studies have shown that such diets may result in increased magnesium content in rat teeth[10] and in a change in the absolute amount and ratio of calcium and phosphorus.[12] Changes in the calcification mechanism are thus indicated.

### CALCIUM INTAKE DURING TOOTH FORMATION

The calcium intake during tooth formation is also important. Perhaps the relatively small number of instances of obvious hypoplasia in rickets mentioned earlier is misleading. There is evidence that the caries rate is higher among rachitic than among nonrachitic animals.[13] The addition of calcium to the diet at weaning retards development of caries when cariogenic rations are fed, providing tooth development is not complete,[14] while decreasing dietary calcium at this time results in more caries.[15] Better nutrition during the formation of first molars results in fewer pits in these teeth.[16]

The explanation may be that suggested by Lady Mellanby in her early work. She postulated that a slight deficiency in vitamin D during tooth formation could result in a slightly hypoplastic enamel surface.[17] Such a roughened surface might not be observable under ordinary conditions, but nevertheless might predispose to caries later, either by offering a surface to which bacteria could cling more easily, or by changing the relations of the structural elements of the tooth to favor an attack by one or more types of harmful bacteria.[18]

### NUTRITIONAL CHANGES AND THE MATURE TOOTH

It is now becoming clear that small nutritional changes, the effects of which are not noticeable in most instances, probably are more important for the health of the mature tooth than had ever been supposed. This presents an opportunity and a challenge. There is an opportunity to increase the nutritional adequacy of the diet, and a challenge, since much of the earlier research work on caries was done without any knowledge of the early nutritional history of the subjects; therefore, it is impossible to be sure of the validity of all the results.

The erupted tooth, as has been said, presents problems of a different order, but nutritional factors still are important. There are two major harmful changes which may occur in a mature tooth: erosion and caries. In each case the predisposing nutritional cause is clear-cut, but as stated previously, it will become apparent that seemingly minor factors, often not well understood, may play an important part in the whole picture.

Erosion, loss of enamel due to chemical action, is almost entirely caused by acids on the tooth surfaces. These acids may come from a persistent habit of sucking

10. Cremer, H. D., and others. Nutritional factors in tooth and bone formation. II. Mineral content of teeth in a caries-producing diet. Biochem. Ztschr. 324:83, 1953.

11. Herrmann, M., and Cremer, H. D. Animal experimental studies on nutrition and dental caries. Effects on structure and chemical synthesis of the teeth. Deut. Zahnärztl. Ztschr. Supp. 61-8 June 1953.

12. Hartles, R. L. Effect of a high sucrose diet on the calcium and phosphorus content of enamel and dentin of rat incisors. Biochem. J. 48:245 Feb. 1951.

13. Granados, H.; Glavind, J., and Dam, H. Observations on experimental dental caries. XII. The influence of rickets. Odont. Tskr. 57:167, 1949.

14. Constant, M. A., and others. Dental caries in the cotton rat. XIV. Further studies of caries production by natural diets with especial reference to the role of minerals, fats, and the stage of refinement of cereals. J. Nutrition 53:17 May 1954.

15. Constant, M. A., and others. Dental caries in the cotton rat. XV. The effect of tooth maturity and minerals on caries production by semi-synthetic diets. J. Nutrition 53:29 May 1954.

16. Cox, G. J., and Hagan, C. W. The relative occurrence of pits in human deciduous molars and the possible relationship to nutrition. (Abst.) J.D. Res. 28:646 Dec. 1949.

17. Mellanby, May. Diet and the teeth: an experimental study. Part I. Dental structure in dogs. Medical Research Council, special report series no. 140, 1929. Part II. A. Diet and dental disease. B. Diet and dental structure in mammals other than dogs. Medical Research Council, special report series no. 153, 1930. London, His Majesty's Stationery Office.

18. Bibby, B. G. The relationship between microscopic hypoplasia (Mellanby) and dental caries. (Abst.) J.D. Res. 22:218 June 1943.

citrus fruits or acid candies, or from excessive drinking of acid beverages. The latter may exert an additional harmful effect by stimulating caries because of their high sugar content.[19] The distinction between erosion and caries should always be kept in mind, however. There are statements in the literature implicating some acid beverages in the causation of caries when it is clear from the context that they have caused only erosion.

The problem of erosion is far less serious than it might be because saliva has a neutralizing action on acids taken into the mouth as they are when an acid beverage is drunk. Saliva bathes most of the surface of the tooth and tends to prevent harmful accumulation of acid. This is why erosion is not seen in almost every mouth today, in spite of the known high consumption of acid drinks. This protective action of saliva is very important so far as erosion is concerned, but there is a tendency to attribute to it an equal importance in protecting against caries which is unjustified. In caries, the lesion is highly localized, usually under a plaque or in an area where free access of saliva cannot occur. Under such conditions, saliva cannot be expected to be of great value in caries prevention, and most of the experimental studies seem to confirm this expectation.[20]

From a nutritional standpoint, the vital role in caries etiology is played by carbohydrates. This idea is now accepted by almost everyone. It has been known for many years that caries due to this cause is intermittent. Sugar supplied in the diet is rapidly fermented to acid, and this acid is soon used up in dissolving the tooth structure. What has not been so clearly realized in the past has been that the form of the carbohydrate and the materials with which it is mixed are also important. These factors are almost certainly related to the physical state of the foods, since, as has been seen, their systemic action cannot affect the erupted tooth. This has been proved in recent years by feeding diets which are known to cause caries in experimental animals, but giving them by stomach tube. In such instances no caries resulted.[21]

## MISCONCEPTIONS RELATED TO NUTRITION AND TEETH

Present knowledge disposes of a number of misconceptions that, unfortunately, are still widely prevalent regarding the relation of diet to the health of the teeth. Perhaps the most widespread of these misconceptions is the idea that caries can be reduced or eliminated by feeding diets rich in calcium after the teeth have formed. Sometimes supplements of tablets of calcium salts are given; sometimes the intake of milk and other calcium-rich foods is increased. On Children's Dental Health Day each year it is common to see signboards or streetcar cards strongly implying that diets rich in the nutritious foods will reduce caries. Many nutritionists hold to this idea, and many advertisements of health foods promise that these foods reduce tooth decay in addition to being beneficial in other ways.

Enough has been said of the nature of the erupted tooth to show that there is no possibility of such calcium getting into the enamel or altering in any way the progress of attack on the calcified structures of the teeth by acids formed in fermentation of sugars. This is not to say that diets rich in calcium are not needed by growing children and, in lesser degree, by adults, nor is it denied that if a good diet is eaten, there may be less tendency to consume too much carbohydrate. It does say that a good diet in itself will not

19. American Dental Association, Council on Dental Health. Sugar and dental caries: the effect on the teeth of sweetened beverages and other sugar containing substances. J.A.D.A. 47:387 Oct. 1953.

20. Cartier, A.; Cartier, P., and Picard, J. Biochemical studies on dental caries. Rev. stomat. 53:107 Feb.-March 1952.

21. Kite, O. W.; Shaw, J. H., and Sognnaes, R. F. The prevention of experimental tooth decay by tube feeding. J. Nutrition 42:89 Sept. 1950.

reduce or prevent caries.[22] As a matter of fact, some of the most caries-free teeth have been found in the mouths of individuals suffering from severe malnutrition.[23]

Another fallacy, connected in theory at least with the one just discussed, is that "natural" foods, even sugars such as are found in fruits, honey, or even raw sugar, are less harmful than "refined" sugars as sold in markets. This idea is vaguely explained by the theory that such foods contain vitamins or minerals which in some way prevent caries. In the early days of vitamin research, there was at least a prospect that this might be the case, but the many studies in this field in the thirties established positively that none of the vitamins had any direct effect on caries, however important they were in tooth formation. It is true that there are inconclusive studies which claim to show that high intakes of vitamin D or some mysterious factor related to exposure to sunlight might reduce caries after the teeth had been formed. These experiments, however, have never been clearly substantiated. Vitamins may cause formation of teeth which resist caries, but once teeth have been formed, the systemic effect of vitamins cannot change the response of the tooth to the local factors of caries.[24]

Thus it would be expected that a diet rich in sugars from fruits, honey, or other "natural" sources would be as cariogenic as one rich in refined sucrose, and this has been found to be true.[25-27] Aside from the fact that studies of the vitamin or mineral content of raw sugars have not revealed appreciable amounts of nutritionally desirable substances, there is considerable direct evidence that excessive consumption of natural sugars is as harmful as excessive consumption of refined sugars.[28]

Nevertheless, the form in which carbohydrate is taken into the mouth is important. It has been found, for example, that if a considerable amount of fats is present along with the sugar in the diet, less caries results.[29, 30] It may be that there is a mechanical protection of the tooth surface provided by a layer of oily material which spreads over the surface and prevents its contact with the water soluble sugars.

The fluidity of the carbohydrate-containing material is also important. When sugar is dissolved in water[31] or water is added to a diet containing sugar,[32] less caries results than from the same amount of dry sugar. Liquid milk is less cariogenic than the dried milk solids.[33, 34] This result may be related to the effect of sugar solutions in altering the rate of diffusion of the ions concerned in caries: hydrogen,[35] calcium, or phosphate.[36]

Another factor is the stickiness of the

22. Shaw, J. H. Ineffectiveness of certain essential nutrients in the prevention of tooth decay in cotton rat molars. Proc. Soc. Exper. Biol. & Med. 70:479 March 1949.

23. Shourie, K. L. Variation in diet and incidence of dental caries in India. (Abst.) J.D. Res. 26:446 Dec. 1947.

24. Goldberg, H. J. V., and others. The effect of vitamin D on caries in the Syrian hamster (Abst.) J.D. Res. 27:739 Dec. 1948.

25. Shaw, J. H. Replacement of raw sugar for refined sugar in caries producing rations. (Abst.) J.D. Res. 28:676 Dec. 1949.

26. Constant, M. A.; Phillips, P. H., and Elvehjem, C. A. Dental caries in the cotton rat. XII. Natural versus refined sugars. J. Nutrition 43:551 April 1951.

27. Lennon, D. F., and Sullivan, H. R. The relative rates of acid production from "refined" and "natural sugars." D.J. Australia 27:67 April 1955.

28. Dreizen, S., and Spies, T. D. The incidence of dental caries in habitual sugar cane chewers. J.A.D.A. 45:193 Aug. 1952.

29. Granados, H.; Glavind, J., and Dam, H. Observations on experimental dental caries. The effect of purified rations with and without dietary fat. Acta Path. microbiol. Scandinav. 25:453, 1948.

30. Shaw, J. H. Effects of dietary composition on tooth decay in the albino rat. J. Nutrition 41:13 May 1950.

31. Haldi, J., and others. The relative cariogenicity of sucrose when ingested in the solid form and in solution by the albino rat. J. Nutrition 49:295 Feb. 1953.

32. Harris, M. R., and Stephan, R. M. Effect of mixing water in the diet on the development of carious lesions in rats. (Abst.) J.D. Res. 32:653 Oct. 1953.

33. Anderson, E. P., and others. Dental caries in the cotton rat. IX. Effect of milk rations. Proc. Soc. Exper. Biol. & Med. 66:67 Oct. 1947.

34. Anderson, E. P., and others. Dental caries in the cotton rat. X. The effect of fluidity of the ration. J. Nutrition 35:371 March 1948.

35. Forscher, B. K., and Fosdick, L. S. Studies on physicochemical phenomena related to dental caries. I. The effect of sugar on the rate of diffusion of hydrogen ion. J.D. Res. 33:206 April 1954.

36. Fosdick, L. S., and Forscher, B. K. Studies on physicochemical phenomena related to dental caries. II. The effect of sugar on the rates of diffusion of calcium and phosphate ions. J.D. Res. 33:212 April 1954.

food. Bibby[37] and his colleagues have shown that some foods adhere more easily to the enamel surface than do others, and that such foods tend to produce more caries. The proof of the intermittent nature of caries caused by carbohydrates, as discussed earlier, might indicate that such sticky foods would be more harmful than fluids even if the latter contained much dissolved sugar. This has been shown to be true.

### OTHER FACTORS

There are other observations less easy to explain. They, too, probably can be accounted for by some factor in the food that is not well recognized. Thus, it has been established recently that milk or whey powders prepared by drying at high temperatures cause more caries than do similar powders prepared by evaporation in a vacuum at lower temperatures.[38,39] This caries potentiality seems to be due to the destruction of lysine in the heated powders, since addition of lysine reduces their cariogenicity. Lysine alone is not an anti-caries agent, however.[40] This fact indicates again that small differences must be watched for in the nature of the foods eaten, just as the effect of small changes in the diet during tooth formation must be observed.

Even in the case of the effect of fluorides, the physical form in which they are ingested in the diet is significant. It has been known almost from the beginning of fluoride research that fluorides in solid form in foods are not as effective as water-borne fluorides in producing their characteristic physiological effects. This lack of effectiveness is related to the relative ease of absorption of the fluoride ion by the intestinal wall when this ion is already in solution instead of being tied up in some more insoluble form in solid food.

It is equally clear that such solid fluorides in foods cannot affect erupted teeth, since the reaction between two solids is extremely slow. Evidence is now accumulating, however, that a long-continued ingestion of low concentrations of fluoride water can produce a topical effect on the teeth.[41] Earlier studies of the topical application of fluoride solutions in mouth washes showed that this procedure did not alter the enamel surface, no doubt because of the relatively brief and infrequent contacts of the fluoride solution with the tooth surface when the latter is covered with saliva. Now, however, it is being observed that in fluoride areas, even older children, whose teeth have already erupted and so cannot take up fluoride systemically, are showing a reduction in caries. There is also evidence of a higher fluoride content on the surface of such teeth. Thus it seems that prolonged exposure to fluoridated water may have a topical effect. Evidence in this direction is still preliminary, but it offers new hope for the fluoridation program.

### COMMENT

It can be seen in the light of this discussion, that the relation of nutrition to the individual tooth has entered a new phase of investigation. The detailed effects of factors are being studied which have previously been given only a general consideration. From such studies not only new discoveries may be expected which will improve the form and health of the teeth, but also many older ideas may be eliminated whose validity cannot be established by rigorous, controlled investigation.

37. Bibby, B. G. Effect of sugar content of foodstuffs on their caries-producing potentialities. J.A.D.A. 51:293 Sept. 1955.

38. McClure, F. J., and Folk, J. E. Skim milk powders and experimental rat caries. Proc. Soc. Exper. Biol. & Med. 83:21 May 1953.

39. McClure, F. J., and Folk, J. E. Observations on the production of smooth-surface rat caries by diets containing skim milk and whey powders. J. Nutrition 55:589 April 1955.

40. McClure, F. J., and Folk, J. E. Lysine and cariogenicity of two experimental rat diets. Science 122:557 Sept. 23, 1955.

41. Bushel, A., and Smith, D. J. Newburgh-Kingston caries-fluorine study. X. Dental findings for 17 year old group after nine years of fluoride experience. New York J. Dent. 25:215 June-July 1955.

# Newburgh-Kingston caries-fluorine study: final report

The relationship between fluorine and dental caries has arrested the attention of the dental profession since the observations of Frederick S. McKay and G. V. Black on the effect of this element on tooth structure some forty years ago. These observations were made in the course of their studies on the endemic mottling of teeth.

From that time on, interest in the anti-cariogenic power of fluorine has occupied the minds of dental researchers. Some ten years ago, a few controlled studies were initiated in scattered communities, three of the most extensive of which were instituted in Newburgh, N. Y., Grand Rapids, Mich., and Brantford, Ontario. Of the three, the Newburgh-Kingston, N. Y., study has been considered the most ambitious.

Ten years ago at the start of the Newburgh-Kingston project the New York Institute of Clinical Oral Pathology presented what was probably the first symposium on the relation of fluorine to dental caries held anywhere in the world. The Institute published a brochure on the symposium and sent copies to all dental and medical practitioners in the United States and to others who were sufficiently interested to request information on the subject. Some 100,000 copies were distributed. Thus the Institute is justifiably proud of the fact that it is well in the forefront of those who early advocated advances in fluorine research. The Institute's first fluorine symposium of a decade ago was held under the chairmanship of Arthur H. Merritt. Other participants in that symposium were: Frederick S. McKay, H. Trendley Dean, Wallace D. Armstrong, Basil G. Bibby and David B. Ast.

Ten years later, on December 12, 1955, the Institute held a second symposium on the subject, at which time a final report was presented on the Newburgh-Kingston Caries-Fluorine Study. Herman E. Hilleboe, M.D., commissioner, New York State Department of Health, recounted the history of the project. Edward R. Schlesinger, M.D., associate director, Division of Medical Services, discussed its pediatric implications. Harold C. Hodge, Ph.D., professor of pharmacology, University of Rochester, N. Y., spoke on fluorine metabolism, and David B. Ast, director of the Bureau of Dental Health, New York State Department of Health, presented the dental aspects of the study.

These four papers presented at the symposium, which signalize the successful fruition of the ten year Newburgh-Kingston experiment, follow in order.

# History of the Newburgh-Kingston caries-fluorine study

*Herman E. Hilleboe, M.D., M.P.H., Albany, N. Y.*

Dental caries is a disease of such magnitude that practically the entire population of our country suffers from it. Since it starts early in life and is a progressive type of disease, its accumulated ill effects present a problem beyond the capabilities of our present dental personnel and facilities. This is true despite the fact that the United States has the best-trained dentists in the world and the ratio of dentist to population is better than anywhere else. In 1942 it was reported that among 2,000,000 men examined for selective service almost 10 per cent were rejected because they did not have 12 sound teeth in proper position out of a possible complement of 32 teeth.[1]

The health officer concerned with the health status of the people in his region cannot overlook the fact that dental caries is an important public health problem. He must constantly be alert to advances being made in the field of public health. When a new technic to prevent the occurrence or progression of disease is reported, it is his responsibility to evaluate its reliability, validity, safety, effectiveness and acceptability. It is against this background that the use of ingested water fluorides as a public health measure to combat dental caries is considered.

A series of successive observations including (1) the characteristics of a dental enamel defect,[2] (2) the direct relation of ingested water fluorides to this defect[3] and (3) the inverse relationship of dental caries to enamel fluorosis[4,5] inevitably led to the caries-fluorine hypothesis. This hypothesis states that dental caries is present in inverse relationship to the fluoride content of the potable water consumed. Black and McKay,[2] in their early investigations of what was known in 1908 as "Colorado brown stain," did not have the remotest idea that their search for the cause of this stain would ultimately lead to the control of dental caries. McKay made the following observation at the start of the Newburgh-Kingston study:

> The removal of fluorine from water for the prevention of one defect and its addition for the prevention of another totally different lesion is one of the most curious reversals in the whole history of science, and is certainly without precedent in dental history.[6]

The epidemiological studies started by the U. S. Public Health Service in 1931 clearly demonstrated that the degree of mottling of the tooth enamel was in direct proportion to the fluoride ion content of the drinking water. The concern of

Presented as part of a symposium, "Newburgh-Kingston caries-fluorine study: final report," at the New York Institute of Clinical Oral Pathology, Inc., New York, December 12, 1955.

Commissioner, New York State Department of Health.

1. Rowntree, L. G. Medical aspects of Selective Service. New York J. Den. 12:100 March 1942.

2. Black, G. V., and McKay, F. S. An investigation of mottled teeth. An endemic developmental imperfection of the enamel of the teeth heretofore unknown in the literature of dentistry. D. Cosmos 58:477 May 1916.

3. Churchill, H. W. Occurrence of fluorides in some waters of the United States. J. A. W. W. A. 23:1399 Sept. 1931.

4. Dean, H. T., and others. Domestic waters and dental caries. II. Study of 2,832 white children, aged 12-14 years, of 8 suburban Chicago communities, including Lactobacillus acidophilus studies of 1,761 children. Pub. Health Rep. 56:761 April 11, 1941.

5. Dean, H. T.; Arnold, F. A., Jr., and Elvove, E. Domestic waters and dental caries. V. Additional studies of relation of fluoride domestic waters to dental caries experience in 4,425 white children aged 12-14 years, of 13 cities in 4 states. Pub. Health Rep. 57:1155 Aug. 7, 1942.

6. McKay, F. S. Fluorine in dental public health. New York, New York Institute of Clinical Oral Pathology, Inc., 1944, p. 17.

public health officials at that time was either to remove the fluoride from the water, which was difficult and expensive to do, or to change the source of the drinking water.

By 1937 the epidemiological studies on mottled enamel pointed to noticeable absence of dental caries in teeth with enamel fluorosis. It was during these investigations that the caries-fluorine hypothesis was conceived. Among the principal studies which helped to establish this hypothesis were the studies by Dean and co-workers[4,5] of 7,257 white children, 12 to 14 years of age, located in 21 cities. The objective of these studies was to determine the extent of dental caries among these children in relation to the fluoride content of their public drinking water supplies. The reports of these investigations in 1941 and 1942 were based on observations made in 11 of the cities using potable water having less than 0.5 ppm fluoride (F), three with 0.5 to 0.9 ppm fluoride (F), and four with 1.0 to 1.4 ppm fluoride (F) and three with more than 1.4 ppm fluoride (F). The DMF (decayed, missing and filled) rates in these cities were in inverse relation to the amount of fluoride ion in the drinking water, and ranged from 7.4 DMF per child to 4.16, to 2.94, to 2.44.

All the studies prior to this time were based on data obtained from regions where the fluoride ion was found naturally present in potable water, compared with data from regions where the water supply was fluoride-deficient. These data demonstrated 60 per cent less dental caries experience in regions where water contained the fluoride ion at approximately 1 ppm, when compared with the fluoride-free regions; furthermore, this reduction in dental caries experience was possible without the hazard of disfiguring, mottled enamel.

In 1939, Cox and his co-workers[7] suggested that a considerable reduction in human dental caries could be effected by supplying optimum amounts of fluorine in food and water during the tooth-forming years.

Ast,[8] in 1942 prepared a thesis on the caries-fluorine hypothesis in which he suggested a plan to test this hypothesis and outlined the details for such a study. He suggested that two comparable fluoride-free communities be selected and have the water supply of one treated with sodium fluoride to bring its fluorine content up to approximately 1 ppm while the second community would continue to use its fluoride-deficient water supply. He suggested a long-range study of at least 10 to 12 years.

In December 1942, several members of the New York State Department of Health met to discuss the proposed study, and in January 1943 a favorable report was made to Edward S. Godfrey, M.D., then the State Commissioner of Health. Dr. Godfrey, after studying the plan, appointed a technical advisory committee on the fluoridation of water supplies, and asked the Committee to study the proposals to determine if such a study should be undertaken and, if so, what types of medical and dental examinations would be necessary to determine the efficiency and safety of the procedure.

At the same time the Department explored the selection of communities suitable for such a study. Newburgh and Kingston, located about 35 miles apart on the Hudson River, each with a population of about 30,000, and each using a fluoride-deficient water supply, were suggested for the study. The proposal was discussed with the local health officers, physicians, dentists and key lay persons. It then was presented to the City Council of Newburgh, which agreed to participate as the study area and to have its water supply treated with sodium

7. Cox, G. J., and others. Experimental dental caries. IV. Fluorine and its relation to dental caries. J. D. Res. 18:481 Dec. 1939.

8. Ast, D. B. Caries-fluorine hypothesis and a suggested study to test its application. Pub. Health Rep. 58:857 June 4, 1943.

fluoride to bring its fluoride (F) content up to 1.0 ppm. Kingston also agreed to serve as the control area and continue to use its fluoride-deficient supply without change.

On April 24, 1944, the technical advisory committee on the fluoridation of water supplies met with members of the staff of the New York State Department of Health. After a careful review of the literature and a discussion of the objectives of the study, the committee unanimously approved the study and agreed to work with members of the Department in setting up the types of examinations necessary and in determining the frequency at which these examinations should be made.

One of the questions which was raised during the early discussion of this study related to possible liability for damages on the part of either the City or State in the event anyone claimed ill effects from drinking fluoridated water. This question was addressed to the Attorney General of New York State on March 14, 1944, and on April 28, 1944, he replied, concluding his letter as follows:

> Liability of the State for negligence could arise from three circumstances: (1) if the State Department of Health were to recommend the introduction of fluorine in amount higher than scientific knowledge disclosed to be safe; (2) if the Department were to undertake the supervision of the introduction of the fluorine and in that respect fail to exercise care that only a safe quantity be used; and (3) if the Department failed to exercise care in guarding against the introduction of excessive amounts of fluorine in connection with its duties as to potable waters under Article 5 of the Public Health Law.
>
> My answer to your inquiry is, therefore, that no negligence could be attributed to either the city or the state by the introduction of fluorine into a city water supply upon the recommendation of the Department of Health, if the amount of fluorine introduced is only such as has been found by scientific studies to be safe. The municipality would be liable for negligence if amounts were introduced, intentionally or through negligence, in excess of such as scientific knowledge discloses to be safe. The State might be liable in any of the three possible situations I have supposed.

In June 1944 the collection of basic data was started. These included meticulous dental examinations and comprehensive medical examinations. The details and results of these examinations, which have been repeated periodically through June 1955, will be described by other papers in the symposium. It is important to point out that the State Department of Health was guided by an advisory committee consisting of outstanding pediatricians, roentgenologists, pharmacologists and dentists throughout the entire study, and progress reports were reviewed by this Committee and the Department's staff periodically.

In March 1944 the City Council of Newburgh approved the water fluoridation program for its city; the local newspaper publicized the project. It was not until May 2, 1945, however, that the water supply of Newburgh was treated with sodium fluoride to bring its fluoride (F) content up to 1.0 - 1.2 ppm. This level has been maintained continuously since then.

During the interim between March 1944 and May 2, 1945, the local health officer in Newburgh received many complaints from local citizens that the fluoridated water was discoloring their saucepans. The most common complaint was of digestive disturbances. One woman complained to her dentist that the "fluoride water" had caused her denture to crack. These incidents all occurred before the fluoride was added to the water supply. Sometime after May 2, 1945, the local paper carried an editorial which pointed out to the people how some persons can imagine all sorts of disabilities from nonexistent causes. That ended the complaints.

This is an interesting point to consider because of the type of opposition to water fluoridation which has arisen in many parts of the country during the past few years. The Newburgh-Kingston Study has demonstrated beyond question the effectiveness and the safety of water

fluoridation as a public health procedure. Despite the comprehensive studies in the laboratory and among human populations in New York State and elsewhere[9] on effectiveness and safety, there has developed a vociferous minority which has succeeded in some areas in delaying the initiation of local water fluoridation programs, and in others, actually reversing favorable action.

The opposition stems from several sources, chiefly food faddists, cultists, chiropractors, misguided and misinformed persons who are ignorant of the scientific facts on the ingestion of water fluorides, and, strange as it may seem, even among a few uninformed physicians and dentists. One very effective opposition speaker in the West, purported to be a research chemist who saw water fluoridation as a Communist plot to sabotage our country, was actually an escaped inmate from an Illinois mental institution. In Connecticut, a woman who calls herself a "research scientist" trained at Harvard and Columbia, was discredited by the authorities of both universities. She is, in fact, a person who has been charged by the police with impersonation.

Another exponent of the opposition group is a dentist in Ohio who never attended a dental college but was blanketed into the dental profession in 1900 when Ohio started to license dentists. This person has been active in other opposition campaigns such as the unwarranted claims that using aluminum cooking utensils causes cancer. He claims Fellowship in the "American Association for Medico-Physical Research" which the American Medical Association investigated and characterized as "an organization . . . devoted to the Abrams idea (healing with electrons) and several other unscientific but apparently profitable methods. . . ."[10]

Still another source of opposition comes from the Citizens Medical Reference Bureau. The main function of representatives of this Bureau appears to be opposition to vaccination and what they call compulsory medicine and surgery for children and adults. To the best of knowledge the Bureau has no licensed medical personnel among its officers or directors.

These are but a few of the opponents of water fluoridation whose background in no way qualifies them to evaluate a scientific question.

There are some physicians and dentists of good standing who have questioned the safety of water fluoridation. In no instance, however, have they given evidence which has been substantiated that the ingestion of water fluorides at the recommended concentration is in any way harmful. Their opinions are purely personal and unsubstantiated by fact. They cannot match the evidence presented in scientific studies which demonstrate the safety and effectiveness of water fluoridation.

When it is considered that there are approximately 216,000 physicians and 92,000 dentists in this country, it is not unusual to find a few who question the safety of any new public health practice. If vaccination or pasteurization of milk or chlorination of water supplies, all of which met with violent opposition when first introduced and even today have some opposition by a few professional men, are considered, it is not difficult to understand why some professional people, who should know better, oppose water fluoridation. Yet no one can deny today that these public health practices which are now universally accepted have contributed immensely to the improved health of our people.

On January 2, 1951, on the basis of five years of research in Newburgh and Kingston and after careful review of the literature, a statement of policy for New York State was issued by the State Health

9. Shaw, James H., editor. Fluoridation as a public health measure. Washington, D. C., American Association for the Advancement of Science, 1954.

10. Toledo Blade, May 27, 1954.

Department with regard to water fluoridation as a public health procedure. In view of the positive reports dealing with ingested water fluorides, it was recommended that all communities in the State which could fluoridate their water supplies under adequate control measures should do so. At the same time specific criteria were prepared; these dealt with the installation of fluoride dispensing equipment, the laboratory tests which would be required to assure uniform application and the duties of the operator of a water treatment plant planning to use water fluoridation.

To date, 31 communities in upstate New York are using fluoridated water, while five communities have had their engineering and control plans approved by this Department and are ready to start fluoridation programs. As of October 1, 1955, in the United States, 1,115 communities have fluoridation programs in operation, serving more than 22 million persons.

Referring to the proposed Newburgh-Kingston Caries-Fluorine Study in 1944, Dr. Frederick S. McKay stated the following:

> When a vision appears it remains only that, until some farseeing individual recognizing the reality translates it into accomplishment. It is a noteworthy achievement to marshal the facts and evidence and convincingly present them to the responsible officials of a community as was done in Newburgh, New York.[8]

In effect, the Newburgh-Kingston Caries-Fluorine Study represents a striking example of applied research in public health. This is the way in which new programs in public health should have their inception. First, public health scientists need to make some basic assumptions, then they set up hypotheses. Next, the workers test these hypotheses in the field using human resources and the scientific method to gain results economically and in the shortest time possible. Then they are ready to pass on the benefits to the citizens of the state whose health it is the privilege and responsibility of the public health worker to preserve. This is public health in action in the modern age of science.

This public health project could not have been started or completed without the help of the advisory committee which has diligently guided responsible officials and assured them that the study was being carried on under the strictest scientific methods so necessary in this kind of study. The Committee has served for 11 years, and public health officials are deeply appreciative of the services of all Committee members. The civic authorities in both Newburgh and Kingston, the school authorities in both of these cities, and the professional groups whose cooperation made the study possible, are due the special thanks of the health department and the medical and dental professions.

The story of the treatment of public water supplies with fluorides, to control one of the nation's costly and troublesome diseases, dental caries, forms a chapter in the history of public health of which all can be proud.

*Object of Science* • The object of experimental science is "to discover the laws of natural phenomena, for the purpose not of foreseeing them but of regulating them at pleasure and mastering them. *Claude Bernard.*

# Newburgh-Kingston caries-fluorine study
# XIII. Pediatric findings after ten years

*Edward R. Schlesinger,* M.D., M.P.H., Albany, N. Y.;*
*David E. Overton,† M.D., M.P.H., Riverhead, L. I., N. Y.;*
*Helen C. Chase,‡ M.Sc., and Katherine T. Cantwell,§ B.A., Albany, N. Y.*

Since the fall of 1944, when the plan of the New York State Department of Health for the control study on water fluoridation in the cities of Newburgh and Kingston was first presented before the New York Institute of Clinical Oral Pathology, the use of water fluoridation to prevent dental caries has changed from an alluring prospect to a widely accepted measure of public policy. Raising the concentration of fluoride-deficient water supplies to an optimal level of 1.0 to 1.2 ppm fluoride (F) is, on the basis of all available evidence, a measure with a wide margin of safety.

At the time the Newburgh-Kingston study was first proposed, however, the body of evidence related entirely to information obtained from regions in which the drinking water at its source already contained amounts of fluoride at optimal or excessive levels. Persons growing up in these regions and regularly drinking water containing even several times the optimal amount of fluoride appeared to be no different in general health and showed no greater proportion of physical defects, other than possible dental mottling, than did persons in nearby regions who drank fluoride-deficient water. There was no reason to believe that fluoride, when added to the drinking water as a routine part of the water treatment process, would act differently from fluoride present in the water at the source. Nevertheless, it was considered desirable to test this remote possibility by periodic medical examination of groups of children under carefully controlled conditions.

## METHOD OF STUDY

As described in several previous papers giving the results at various stages in the progress of the Newburgh-Kingston study, closely similar groups of children were selected for long-term observation in the cities of Newburgh and Kingston.[1-3] There is no need to restate here the close comparability of New-

Presented as part of a symposium, "Newburgh-Kingston caries-fluorine study: final report," at the New York Institute of Clinical Oral Pathology, Inc., New York, December 12, 1955.

*Associate director of medical services, New York State Department of Health, and assistant clinical professor of pediatrics, Albany Medical College.

†Formerly, associate physician, pediatric research, Newburgh-Kingston Caries-Fluorine Study; at present, deputy commissioner of health, Suffolk County Department of Health.

‡Senior biostatistician, New York State Department of Health.

§Biostatistician, Division of Medical Services, New York State Department of Health.

1. Schlesinger, E. R.; Overton, D. E., and Chase, H. C. Newburgh-Kingston caries fluorine study. II. Pediatric aspects—preliminary report. Am. J. Pub. Health 40:725 June 1950; V. Pediatric aspects—continuation report. Am. J. Pub. Health 43:1011 Aug. 1953.

2. Overton, D. E., and Chase, H. C. Newburgh-Kingston caries fluorine study. VI. Pediatric aspects—current status. New York State J. Med. 54:2452 Sept. 1, 1954.

3. Schlesinger, E. R.; Overton, D. E., and Chase, H. C. Long-term medical study of children in a community with a fluoridated water supply. In Fluoridation as a public health measure, Shaw, James H., editor. Washington, D.C., American Association for the Advancement of Science, 1954, p. 131-147.

burgh, in which the water supply was fluoridated to a level of 1.2 ppm of fluoride (F), and Kingston, the nearby control community, in which the water supply was maintained essentially fluoride-free for the duration of the study. The growth and development of children in the two cities was used as one index of any possible systemic effects from fluoride in the amount used. Comparison also was made of the prevalence of various specific conditions in the two groups, as disclosed by medical histories, physical examinations, and laboratory and roentgenographic studies.

At the start of the study, it was planned to enroll initially about 500 children residing in each of the two cities. The ages of the children ranged from birth to nine years. The addition of groups of infants during the ensuing years would include children in Newburgh who had been exposed to fluoride during the entire period of their fetal development, and groups of similar age in Kingston. The number of children finally enrolled in the study in each city is shown in Table 1. In all, there were 817 children residing in Newburgh and 711 in Kingston. Of these, 500, or 61.2 per cent, returned for their final examinations at the end of ten years in Newburgh; 24 are not included in the detailed analysis of the results because a comparable age group was not examined in the control city. In Kingston, 405, or 56.9 per cent, were seen in the final year. Actually, 88.0 per cent of the children still living in Newburgh at the end of the study decade returned for their final examinations, indicating the high degree of interest and the cooperative spirit of the people of Newburgh in the outcome of the study. In Kingston, a somewhat smaller proportion, 73.6 per cent, returned for their final examinations. The poorer return in Kingston is understandable, since the Kingston families, being a control group, did not have the same sense of participation in the study as the families in Newburgh. The proportion of children in the two cities dropping out of the study for various reasons is given in Table 2.

**Table 1 • Number of children examined in final year, by year of entry into study**

| Year of entry into study by city | Number of children brought into study | Number of children examined 1954-1955 |
|---|---|---|
| Newburgh | | |
| Total | 817 | 500* |
| 1946 (spring) | 625 | 359 |
| 1946 (fall) | 18 | 15 |
| 1947-48 | 100 | 74 |
| 1948-49 | 74 | 52 |
| Kingston | | |
| Total | 711 | 405 |
| 1945-46 | 507 | 275 |
| 1947 | 102 | 60 |
| 1948 | 102 | 70 |

*Twenty-four of these children are not included in the analysis, since a comparable age group was not examined in Kingston.

**Table 2 • Number of children lost from study, by reason for leaving study**

| | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children | Per cent of children | Number of children | Per cent of children |
| Total children in study | 817 | 100.0 | 711 | 100.0 |
| Children lost from study | 317 | 38.8 | 306 | 43.0 |
| Reason for loss: | | | | |
| Child died | 5 | 0.6 | 3 | 0.4 |
| Family moved from city | 244 | 29.9 | 158 | 22.2 |
| Parent not interested | 56 | 6.9 | 123 | 17.3 |
| Child refused exam. | 9 | 1.1 | 14 | 2.0 |
| Child working | 3 | 0.4 | 8 | 1.1 |

Table 3 • Age of children at time of final examination

| Age to nearest birthday (years) | Number of children examined | | | |
|---|---|---|---|---|
| | Newburgh | | Kingston | |
| | Number of children | Per cent of children | Number of children | Per cent of children |
| Total examined | 476 | 100.0 | 405 | 100.0 |
| 7 | 68 | 14.3 | 27 | 6.7 |
| 8 | 46 | 9.7 | 60 | 14.8 |
| 9 | 59 | 12.4 | 55 | 13.6 |
| 10 | 24 | 5.0 | 36 | 8.9 |
| 11 | 46 | 9.7 | 43 | 10.6 |
| 12 | 54 | 11.3 | 37 | 9.1 |
| 13 | 36 | 7.6 | 35 | 8.6 |
| 14 | 52 | 10.9 | 33 | 8.1 |
| 15 | 30 | 6.3 | 12 | 3.0 |
| 16 | 30 | 6.3 | 35 | 8.6 |
| 17 | 21 | 4.4 | 23 | 5.7 |
| 18 | 10 | 2.1 | 9 | 2.2 |

Apart from special studies and examinations carried out in the course of the ten year period, the basic plan called for annual visits of the children to the study clinic. On each visit a careful medical appraisal would be carried out, including a careful history, a complete physical examination, selected physical measurements and laboratory and roentgenographic studies. Although the routine laboratory studies were omitted in the control group during most of the study, they were included in the final examination. The details of the examination, along with a copy of the form used for recording the physical examination, have been given in a previous paper, in which the method of analysis of the material is also described.[3] One approach mentioned is the analysis of the prevalence of certain findings, in any given year, in comparable age groups in the study and control cities. The other approach is the longitudinal study of the groups of children at successive examinations over a period of years in each of the cities. Both these methods have been used in the analysis of the accumulated data.

The age distribution of the children at the time of the final examinations is shown in Table 3. The age at the nearest birthday ranges from 7 to 18 years, with about one quarter of the children well into adolescence. When a condition of possible significance to the child's health was discovered on the examination, referral was made to the family physician. Of the 476 children examined in Newburgh, 19, or 4.0 per cent, were so referred, as compared with 20 (4.9 per cent) of the 405 children examined in Kingston. The reasons for referral to the family physician are presented in Table 4.

## RESULTS

Apart from the difference in the proportion of the children who had undergone tonsillectomy, there was no significant difference in the findings on physical examination. As previously reported, the difference in the rate of tonsillectomies had existed prior to the start of the study and was apparently a reflection of differences in medical practice between the two cities.[3]

Careful measurements were made of the weight and height of each child on every visit. No significant differences were found between comparable age-sex groups in the rate of increase during the years of the study. When any group was found to be above or below the average of the comparable group in the other city in either measurement at the start of the study, the difference tended to be maintained throughout the course of the ensuing decade. Such differences as did occur usually were traceable to the presence of an unusually tall or short child or to an unusually heavy or light child in a particular group. This child would weigh the average of the group in its direction. The growth curves for two groups selected for presentation on previous reports as characteristic of the entire group of children studied are carried through to the final examination on Figures 1 and 2.

The onset of menstruation in girls was

**Table 4** • Number of children referred to family physician at final examination, by reason for referral

| | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children | Per cent of children examined | Number of children | Per cent of children examined |
| Total children examined | 476 | 100.0 | 405 | 100.0 |
| Number referred | 19 | 4.0 | 20 | 4.9 |
| Reason for referral: | | | | |
| Obesity | 8 | 1.7 | 9 | 2.2 |
| Urine findings | 3* | 0.6 | 5 | 1.2 |
| Blood findings | 4 | 0.8 | 0 | 0.0 |
| Findings on roentgenograms | 2 | 0.4 | 5 | 1.2 |
| All other | 2† | 0.4 | 1‡ | 0.2 |

*Includes a child known to be diabetic.
†One with lordosis; one with a plantar wart.
‡One child with ringworm of scalp.

selected as an index of the rate of sexual maturation, since the menarche is an event which is usually readily dated. The distribution of ages at the nearest birthday at which menstruation first occurred is shown in Table 5. The average age at the menarche was 12 years among the girls studied in Newburgh and 12 years 5 months among the girls in Kingston. No statistical significance could be demonstrated in this difference, nor in the difference between the two cities in the proportion of girls who had passed the menarche.

As on each previous annual examination, roentgenograms were taken of the right hand and both knees of each child. On the final examination a lateral roentgenogram of the lumbar spine was also included. Since osteosclerosis is known to be an early manifestation of chronic fluoride intoxication, with the lumbar spine among the earliest sites in the skeletal system to show this disturbance,[4] special attention was paid to the density of the roentgen ray shadow when the roentgenograms were studied. John Caffey, professor of clinical pediatrics at the College of Physicians and Surgeons, Columbia University, who interpreted all the roentgenograms during the course of the study, had no prior knowledge of the residence of the child at the time of interpretation of the film. He was not able to detect any difference in bone density as reflected on the roentgenograms from the two cities. The absence of evidence of increased bone density in the lumbar spine after ten years of exposure to fluoridated water during the period of active growth has given added weight to the negative observations in the roentgenograms of the wrist and knees on earlier examinations.

Estimation of bone age, that is, the level of skeletal maturation of a given child when the observations of his roentgenograms are compared with generally accepted standards by chronological age, is another method of estimating the rate of a child's physical development. Dr. Caffey examined the roentgenograms of each child from this viewpoint and indicated whether the bone age is abnormally retarded or advanced or within the limits of normal development. The findings, as shown in Table 6, indicate no significant difference in the rate of skeletal maturation among the children in the two cities.

At Dr. Caffey's suggestion, Richard L. Day, chairman of the department of

4. Leone, N. C., and others. Roentgenologic study of a human population exposed to high-fluoride domestic water: a ten-year study. Am. J. Roentgenol. 74:874 Nov. 1955.

pediatrics of the State University of New York College of Medicine in New York City, was asked to make an independent estimation of the bone age of groups of children in the two cities. Roentgenograms of a group of 100 children, aged 9 through 12 years, in each city, were taken at random from the study and control groups. The children in the Newburgh group had been using fluoridated water for a period of from eight to nine years at the time these roentgenograms were taken. The only information available to Dr. Day, at the time of his examination, was the sex of the child whose roentgenogram he was interpreting. Neither the age of the child nor the city of residence was provided. No significant differences were found in the level of skeletal maturation between the age and sex groups in the two cities.

In interpreting the roentgenograms, Dr. Caffey recorded other observations in addition to bone density and bone age, whether or not he considered these findings to be of any pathological significance.

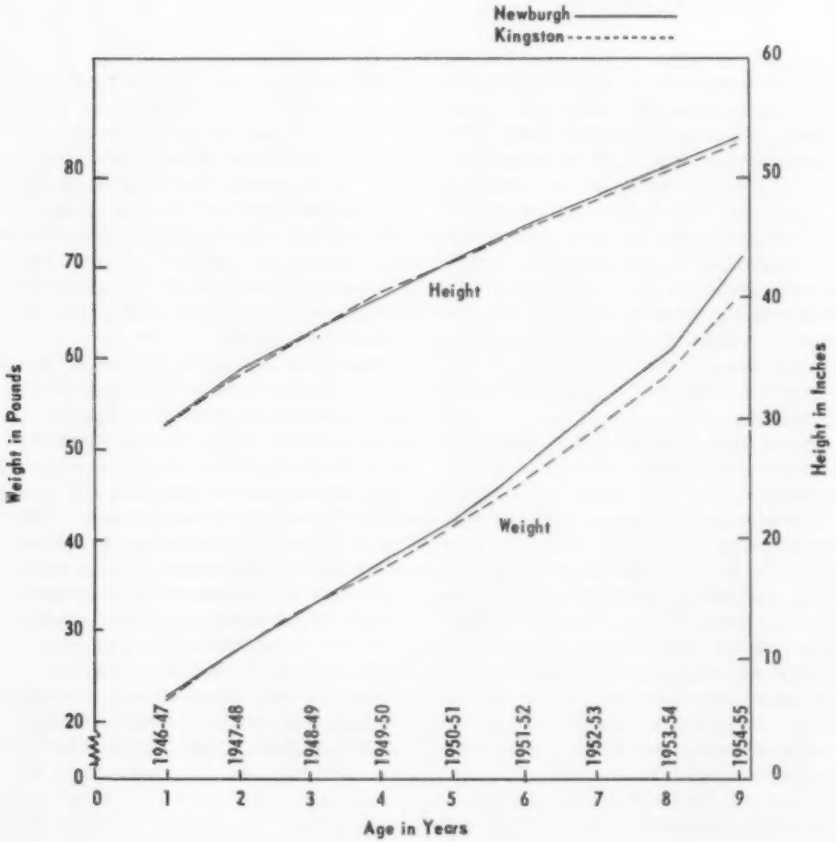



*Fig. 1 • Average height and weight at successive examinations of 22 boys in Newburgh and 29 boys in Kingston, one year old (age at nearest birthday) in 1946-1947 examinations*

The number and percentage of children in the two cities with specified conditions shown on the roentgenograms are given in Tables 7, 8, and 9. These data are presented as recorded, and there is no indication that any of the findings listed in the body of the tables are of pathological significance or that they are in any way related to the use of fluoridated water. In certain of the findings, such as sclerotic epiphysial ossification centers and sesamoid bones shown in the roentgenograms of the hand and wrist, a higher proportion of the children in one city was found, whereas in other findings, such as cortical defects in the roentgenograms of the knees, the other city had a greater proportion. The defects in the cortical walls of the tubular bones have been described elsewhere by Dr. Caffey.[5] These benign lesions of childhood have been found to

5. Caffey, John. On fibrous defects in cortical walls of growing tubular bones: their radiologic appearance, structure, prevalence, natural course, and diagnostic significance. In Advances in pediatrics, Levine, S. Z., editor. New York, Interscience Publishers, 1955, p. 13-51.

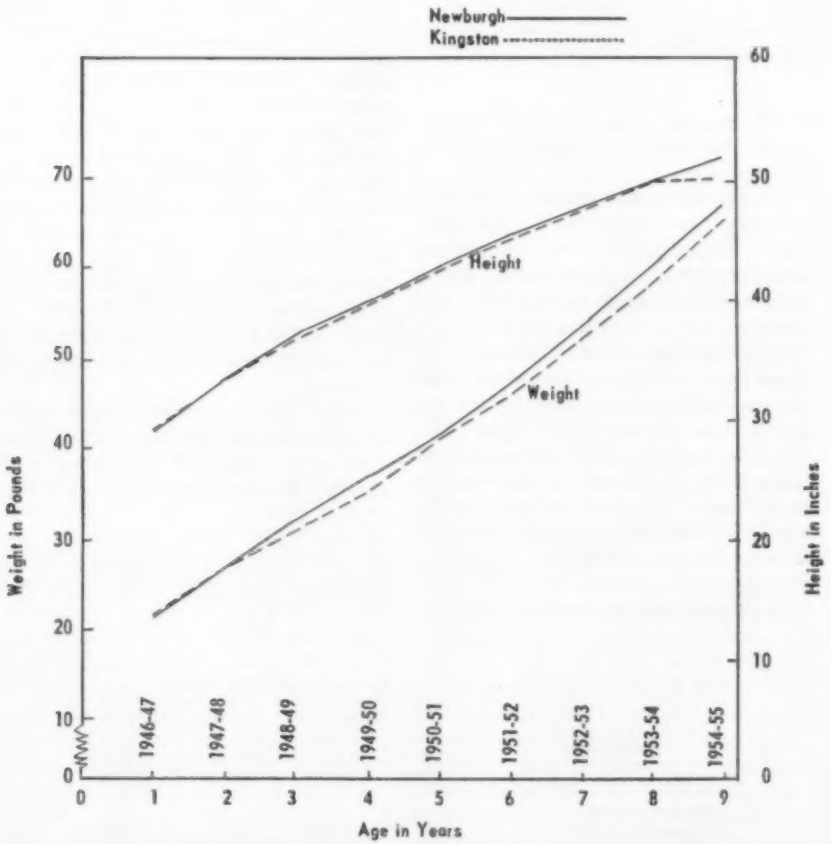



*Fig. 2 • Average height and weight at successive examinations of 37 girls in Newburgh and 26 girls in Kingston, one year old (age at nearest birthday) in 1946-1947 examinations*

**Table 5** • Menstruation in girls

| Age to nearest birthday (years) | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Present | Absent | Present | Absent |
| 7 | — | 36 | — | 10 |
| 8 | — | 30 | — | 25 |
| 9 | — | 35 | — | 24 |
| 10 | — | 9 | — | 16 |
| 11 | 2 | 24 | 3 | 12 |
| 12 | 8 | 14 | 5 | 12 |
| 13 | 16 | 5 | 15 | 4 |
| 14 | 14 | 3 | 8 | 4 |
| 15 | 11 | — | 7 | — |
| 16 | 11 | — | 14 | — |
| 17 | 11 | — | 9 | — |
| 18 | 4 | — | 4 | — |

Mean age at onset of menstruation: Newburgh, 12 years 0 months; Kingston, 12 years 5 months.
Per cent of girls past menarche: Newburgh, 35.2; Kingston, 35.0. (Per cent adjusted to age distribution in Kingston.)

be of common occurrence in his experience and have been asymptomatic in every instance.

Various laboratory examinations were performed on each child on the final visit. The hemoglobin level, determined with the use of a photoelectric hemoglobinometer, showed no significant differences between the two cities. Although there were a few more children in the range below 12.9 Gm. per hundred milliliters in Newburgh, the mean for the two groups was closely alike (Table 10). Similarly, a slightly higher proportion of children in Newburgh were found to have a total erythrocyte count below 4,400,000 per milliliter, but the difference between the two groups as a whole was not significant (Table 11). The total leukocyte counts were essentially the same in the two cities, with a slightly higher proportion of children in Kingston showing a count over 10,000.

Routine urine analysis also showed no significant differences in the findings in the two cities. Sugar was found in urine specimens from two children in each city, and abnormalities in the urinary sediments were found in three instances in each city. More than a trace of albumin was found in four, or 1.1 per cent, of the children in Kingston, as compared with 2, or 0.4 per cent, in Newburgh. Because of reports that fluoride in highly toxic quantities produces pathological changes in the kidneys of experimental animals, a special study of the quantitative excretion of formed elements in the urine, using a modified Addis technic, was carried out in the two cities to detect any possible minimal irritative effect on the kidneys of prolonged use of fluoridated water. The result of this study, performed on two groups of 12-year-old boys, is being reported in detail elsewhere.[6] No significant differences were found in the quantitative excretion of albumin, red blood cells and casts between these groups of normally active boys in Newburgh and Kingston.

As in several previous years, special ophthalmological and otological examinations were performed on a group of 25 children in Newburgh. It was felt that,

6. Schlesinger, E. R.; Overton, D. E., and Chase, H. C. Study of children drinking fluoridated and nonfluoridated water: quantitative urinary excretion of albumin and formed elements. J.A.M.A. 160:21 Jan. 7, 1956.

**Table 6** • Skeletal maturation of children on final roentgenographic examination

| Maturation | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children | Per cent of children | Number of children | Per cent of children |
| Number of children with maturation stated | 472 | 100.0 | 370 | 100.0 |
| Within normal limits | 461 | 97.7 | 361 | 97.6 |
| Abnormally retarded | 10 | 2.1 | 7 | 1.9 |
| Abnormally advanced | 1 | 0.2 | 2 | 0.5 |

**Table 7** • Number of children with specified findings on roentgenographic examination of lumbar spine

| Condition | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children with condition present | Per cent of children examined* | Number of children with condition present | Per cent of children examined* |
| Number of children of whom roentgenograms were made | 458 | 100.0 | 372 | 100.0 |
| Ring ossification centers | 126 | 27.5 | 91 | 24.5 |
| Plane of articular facets | 0 | 0.0 | 0 | 0.0 |
| Other: | 4 | 0.9 | 4 | 1.1 |
| Marked notching of vertebral bodies | 1 | | 1 | |
| Osteochondritis juvenilis of the spine | 2 | | – | |
| Schmorl's nodule | 1 | | 1 | |
| Spondylolisthesis | – | | 1 | |
| Defects in lamina of fifth lumbar vertebra | – | | 1 | |

*Percentages are not additive.

if pathologic findings were discovered in greater than the expected prevalence, larger groups could then be examined in Newburgh and a control group examined in Kingston.

On testing with the Snellen chart, the visual acuity of 17 of the 25 children was found to be 20/20 or better. With refracting lenses, six could read 20/20 or better in at least one eye. In two children with myopia, one child's vision could be corrected to 20/50 in the right eye and 20/25 in the left eye, and the other child's vision could be corrected to 20/25 in the right eye and 20/25 in the left eye. Visual fields were apparently normal for form in all 25 children. In the 18 children in which the blind spot could be delineated accurately, all were found to be normal. No abnormalities were found in the fundi of the eyes of any of the children examined.

Audiometric testing, using a pure tone diagnostic audiometer, showed only two children with an apparent hearing loss of 3.5 per cent or greater in the better ear. One of these children, with a hearing loss of 3.5 per cent, was just recovering from a bout of acute rhinopharyngitis. The other child, with an apparent hearing loss of 12.8 per cent in the right ear and 11.3 per cent in the left ear, was very inattentive during the examination; the validity of the hearing loss is highly questionable.

The findings on both the ophthalmological and otological examinations in the group of children selected fall well within the limits expected of any normal group of children of the age studied.

Comparison was made of the stillbirth and maternal and infant mortality rates in Newburgh and Kingston for a period starting five years before the initiation of fluoridation and during the ten years of the study. The relatively small numbers involved gave rise to considerable variation in the annual mortality rates, but the long-term downward trends were similar in the two cities and there was no

Table 8 • Number of children with specified findings on roentgenographic examination of hand and wrist

| Condition | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children with condition present | Per cent of children examined* | Number of children with condition present | Per cent of children examined* |
| Number of children examined | 474 | 100.0 | 375 | 100.0 |
| Transverse lines in bones at wrist | 2 | 0.4 | 1 | 0.3 |
| Sclerotic epiphysial ossification centers | 119 | 25.1 | 134 | 35.7 |
| Presence of sesamoid bones | 129 | 27.2 | 165 | 44.0 |
| Short, thick bones | 1 | 0.2 | — | — |
| Hypoplasia of fifth digit middle phalanx | — | — | 1 | 0.3 |

*Percentages are not additive.

detectable change in the trend in Newburgh after fluoridation.

The crude death rates from cancer and cardiovascular-renal disease in Newburgh and Kingston from 1942 through 1954 are given in Table 12. Analysis of the data shows no consistent pattern from year to year, but it is clear that there has not been any increase in deaths from these causes in Newburgh, as compared with Kingston, during the period of water fluoridation. Although these rates were not adjusted for age distribution, the differences in the proportion of the population found in the various age groups in the two cities in the 1950 census were too small to affect the rates significantly.

## SUMMARY

This report on the findings on the general medical and related examinations during the ten years of the Newburgh-Kingston Caries-Fluorine Study emphasizes the examinations performed ten years after the start of fluoridation of the water supply of Newburgh. At the time the study was proposed, all the scientific evidence available pointed to the safety of drinking water containing about 1.0 ppm of fluoride at the source. There was no reason to believe that fluoride, when added to the drinking water as part of the water treatment process to make up for a deficiency of fluoride, would act in any way differently from fluoride already present. Nevertheless, it was considered desirable to test this remote possibility under the carefully controlled conditions established for the Newburgh-Kingston study.

Closely similar groups of children were studied in Newburgh and Kingston. Excluding those children who dropped out for any reason during the course of the study, 500 of the children enrolled in the study in Newburgh and 405 in Kingston were seen in the final series of examinations. The children in Kingston, where the drinking water supply has been essentially fluoride-free, served as controls for the Newburgh children who drank water fluoridated at a level of 1.2 ppm. No differences of medical significance could be found between the two groups of children; thus further evidence was added to that already available on the safety of water fluoridation.

The examinations performed in the tenth year of the study may be sum-

**Table 9** • Number of children with specified findings on roentgenographic examination of knees

| Condition | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children with condition present | Per cent of children examined* | Number of children with condition present | Per cent of children examined* |
| Number of children examined | 474 | 100.0 | 375 | 100.0 |
| Cortical defect | 64 | 13.5 | 28 | 7.5 |
| Irregular mineralization—medial femoral condyle | 19 | 4.0 | 15 | 4.0 |
| Irregular mineralization—lateral femoral condyle | 41 | 8.6 | 29 | 7.7 |
| Transverse line—in bone at knees | 10 | 2.1 | 2 | 0.5 |
| Vascular foramens in femoral epiphysial ossification centers | 219 | 46.2 | 162 | 43.2 |
| Cleft at base of anterior tibial process | 99 | 20.9 | 70 | 18.7 |
| Other: | 14 | 3.0 | 12 | 3.2 |
| Exostosis | 6 | | 3 | |
| Fabella | 3 | | 1 | |
| Small bones | 2 | | 2 | |
| Longitudinal striations | — | | 1 | |
| Osteochondrosis of tuberosity of tibia | — | | 1 | |
| Large medial femoral condyle | — | | 1 | |
| Osteoid osteoma | — | | 1 | |
| Osteochondrosis | — | | 1 | |
| Irregular patellas | 2 | | — | |
| Generalized rarefaction | 1 | | — | |
| Questionable destruction in 1 fibula | — | | 1 | |

*Percentages are not additive.

**Table 10** • Hemoglobin level

| Hemoglobin (Grams per 100 ml.) | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children | Per cent of children | Number of children | Per cent of children |
| Total | 377 | 100.0 | 375 | 100.0 |
| Less than 12.0 | 2 | 0.5 | 0 | 0.0 |
| 12.0—12.4 | 10 | 2.7 | 2 | 0.5 |
| 12.5—12.9 | 10 | 2.7 | 7 | 1.9 |
| 13.0—13.4 | 39 | 10.3 | 34 | 9.1 |
| 13.5—13.9 | 63 | 16.7 | 109 | 29.1 |
| 14.0—14.4 | 93 | 24.7 | 103 | 27.5 |
| 14.5—14.9 | 102 | 27.1 | 98 | 26.1 |
| 15.0—15.4 | 37 | 9.8 | 13 | 3.5 |
| 15.5—15.9 | 17 | 4.5 | 9 | 2.4 |
| 16.0 or more | 4 | 1.1 | 0 | 0.0 |
| No specimen | 99 | | 30 | |

Average hemoglobin: Newburgh, 14.28 Gm.; Kingston, 14.18 Gm.

**Table 11** • Erythrocyte count

| Number of erythrocytes (millions per cu. mm.) | Newburgh | | Kingston | |
|---|---|---|---|---|
| | Number of children | Per cent of children | Number of children | Per cent of children |
| Total | 472 | 100.0 | 375 | 100.0 |
| Less than 4.125 | 1 | 0.2 | — | — |
| 4.125—4.274 | 1 | 0.2 | 1 | 0.3 |
| 4.275—4.424 | 7 | 1.5 | 1 | 0.3 |
| 4.425—4.574 | 21 | 4.4 | 16 | 4.3 |
| 4.575—4.724 | 101 | 21.4 | 52 | 13.9 |
| 4.725—4.874 | 222 | 47.0 | 149 | 39.7 |
| 4.875—5.024 | 100 | 21.2 | 140 | 37.3 |
| 5.025—5.174 | 15 | 3.2 | 11 | 2.9 |
| 5.175—5.324 | 1 | 0.2 | 4 | 1.1 |
| 5.325 or more | 3 | 0.6 | 1 | 0.3 |
| No specimen | 4 | | 30 | |

Average erythrocyte count: Newburgh, 4.79 million per cubic millimeter; Kingston, 4.83 million per cubic millimeter.

**Table 12** • Death rates from cancer and cardiovascular-renal disease in Newburgh and Kingston per 100,000 population, 1942–1954

| Year | Death rate from cancer | | Death rate from cardiovascular-renal disease | |
|---|---|---|---|---|
| | Newburgh | Kingston | Newburgh | Kingston |
| 1942 | 174.1 | 207.4 | 737.6 | 741.7 |
| 1943 | 212.4 | 193.4 | 872.0 | 865.0 |
| 1944 | 219.0 | 169.0 | 860.0 | 848.5 |
| 1945 | 177.9 | 211.8 | 832.1 | 896.4 |
| 1946 | 222.1 | 282.4 | 818.7 | 776.6 |
| 1947 | 214.7 | 249.5 | 741.8 | 892.6 |
| 1948 | 154.0 | 223.8 | 877.0 | 744.9 |
| 1949 | 188.0 | 188.0 | 865.6 | 807.8 |
| 1950 | 249.1 | 276.0 | 887.3 | 828.1 |
| 1951 | 258.3 | 213.1 | 834.1 | 893.5 |
| 1952 | 235.9 | 198.5 | 735.7 | 828.3 |
| 1953 | 171.5 | 272.3 | 851.2 | 847.7 |
| 1954 | 221.2 | 264.4 | 741.4 | 796.7 |

marized briefly. Each child was given a general medical examination by a qualified pediatrician. Height and weight were measured. Roentgenograms were taken of the right hand, both knees and the lumbar spine, and the bone density and bone age (maturation of the skeleton) were estimated. Laboratory examinations, including hemoglobin level, total leukocyte count and routine urine analysis, were also made. In addition, special studies were performed on smaller groups of children. These studies included detailed examinations of the eyes and ears, with determination of visual acuity, visual fields and hearing levels, and studies of the quantitative excretion of albumin, red blood cells, and casts in the urine.

# Fluoride metabolism: its significance in water fluoridation

*Harold C. Hodge, Ph.D., Rochester, N. Y.*

The purpose of this report is the review of the present knowledge of the metabolism of fluorides, particularly in the human body, and the use of this knowledge in estimating the factors of safety in water fluoridation. In this discussion, many of the biological effects of fluorides (purported or well-established) will receive no mention. On the other hand, there are a few important biological effects of fluorides so well studied that there is an established relation between the effect and the intake of fluoride responsible, specifically, acute fluoride poisoning, crippling fluorosis, osteosclerosis and mottled enamel. The facts of fluoride metabolism give an insight into the nature and in some instances the mechanism of these effects. This report will include a discussion of the following: (1) blood fluoride levels; (2) the rates and mechanisms of urinary excretion of fluoride and (3) the magnitude and mechanisms of bone deposition. In each instance an attempt will be made to estimate the magnitude of the safety factors between these toxic fluoride effects and the fluoride exposure that will accompany the ingestion of fluoridated water. It is concluded from present information that the factors of safety are adequate to justify the practice of community water supply fluoridation.

## BLOOD

Circulating human blood normally contains a trace of fluoride. When the drinking water has only negligible levels of fluoride (<0.1 ppm), on the average, the blood level is about 1 microgram per hundred milliliters of blood.[1] There is a considerable range of variation from individual to individual, and values as high as 10 micrograms per hundred milliliters of blood or higher have been obtained.

Presumably the blood level reflects in some measure the daily intake. Persons living in Rochester, N. Y., prior to water fluoridation ingested mostly by food 1 to 2 mg. of fluoride per day. The drinking water supply in Rochester, N. Y. prior to water fluoridation contained about 0.06 ppm of fluoride (F). When the daily fluoride intake is increased by fluoridating the water supply, the blood level of fluoride increases slightly. For example, in Newburgh, N. Y., where the water supply contains about 1.1 ppm of fluoride (F), the average blood level was 4 micrograms per hundred milliliters of blood. Thus, when Rochester and Newburgh are compared, it is seen that an increase of 20 times in the fluoride water concentration was accompanied by an in-

Presented as part of a symposium, "Newburgh-Kingston caries-fluorine study: final report," at the New York Institute of Clinical Oral Pathology, Inc., New York, December 12, 1955.

This paper is based on work performed under contract with the U. S. Atomic Energy Commission at the University of Rochester Atomic Energy Project, Rochester, N. Y.

Division of pharmacology and toxicology, department of radiation biology, University of Rochester School of Medicine and Dentistry.

1. Smith, F. A.; Gardner, D. E., and Hodge, H. C. Investigations on the metabolism of fluoride. II. Fluoride content of blood and urine as a function of the fluorine in drinking water. J. D. Res. 29:596 Oct. 1950.

crease of only four times in the blood fluoride level. Blood does not tend to accumulate fluoride.

When a large oral dose of fluoride is given to an experimental animal, the blood level rises very rapidly to reach a peak in a half hour to an hour. Thus, in a rat given a near lethal dose of fluoride orally, the blood level in 30 to 60 minutes rose to values of 1,000 to 1,200 micrograms per hundred milliliters of blood.[2] The blood concentrations thereafter fell almost as rapidly so that after two to three hours, only 200 to 300 micrograms of fluoride per hundred milliliters of blood remained. In 24 hours the values were essentially normal, that is, below 20 micrograms per hundred milliliters of blood. The shape of this curve looked like the familiar sugar tolerance curve (except that there were no subnormal levels terminally). When fluorides enter the body, blood fluoride rises to peak concentrations and falls again with extraordinary rapidity.

The body has powerful mechanisms for disposing of the fluoride ion: (1) excretion in the urine and (2) deposition in the skeleton.

### URINARY EXCRETION

Human urine normally contains small amounts of fluoride. In Rochester, N. Y., in the prefluoridation days, urinary levels ranged from less than 0.1 ppm to a little over 1.0 ppm fluoride.[1] The average was approximately the same as the concentration in the drinking water supply, that is, 0.06 ppm. The exact urinary level reflected the amount of fluoride taken in the food, and consequently varied significantly from day to day. Daily excretions of 0.5 or even 1.5 mg. were regarded as normal. In Newburgh, N. Y., the average urinary excretion was about 1.1 ppm, which is numerically nearly identical to the concentration in the drinking water.

When a human being ingests small amounts of fluoride, a significant fraction is promptly excreted in the urine. For example, when normal young adults drank a half a glass of water containing 1.5 mg. of fluoride, a smooth curve of excretion was found in which elevated values were apparent in one hour, and a quarter of the total fluoride had been excreted in three hours.[2] This curve reveals how prompt and effective the mechanism is for removing fluoride from the body.

Further ideas on the effectiveness of fluoride excretion in the urine are gained by consideration of the magnitude of the total halogen pool, mostly, of course, the chlorides of the body. The "standard" 70 kg. man has in his body about 150 Gm. of chloride. When 1.5 mg. of fluoride are added, assuming that the fluoride is completely distributed through the halogen pool, the fluoride must constitute approximately 10 ppm of the chloride-fluoride total (150.0015 Gm.). The normal sodium chloride excretion is about 10 Gm. a day or about 6 Gm. of chloride per day. On an hourly basis, about 250 mg. of chloride are excreted or 750 mg. in three hours. Thus, when approximately 0.5 mg. of fluoride are excreted in three hours, the excreted halide has 700 ppm of fluoride of the chloride-fluoride total. Compared to a body concentration, the urine is highly concentrated with respect to fluoride.

The question arose whether this specific faculty of ridding the body of fluoride involves some special mechanism. Philip Chen[3] studied the removal of fluoride from the blood of adult dogs and its urinary excretion and found that there is no special mechanism for the fluoride excretion in the urine. The rapid excretion reflects the fact that fluoride is resorbed from the urine in the kidney tubule somewhat less efficiently than is

2. Smith, F. A., and Gardner, D. E. Unpublished data.

3. Chen, Philip S., and others. Renal clearance of fluoride. Technical report U.R. 420. Rochester, N. Y., University of Rochester Atomic Energy Project, 1955.

chloride. It is well known that of the chloride filtered through the glomerulus and entering the renal tubule over 99 per cent is resorbed, that is, taken back into the venous blood and returned to the circulation. In comparison, the fraction of fluoride resorbed is about 90 per cent. This may seem to be a highly effective operation in both instances, but so much blood passes through the kidney that this difference in the resorptions of fluoride and chloride accounts for the high rate of elimination of fluoride.

The percentage of the ingested fluoride that appears in the urine is somewhat variable but probably amounts to a half to two-thirds of the daily intake. Reliable data of this sort on humans exposed over protracted periods are not available. Largent,[4] however, carried on a study which lasted over many months in which he systematically increased his daily oral intake of fluorides beginning with about a milligram a day for a month followed by 2 mg. daily, then 5 or 6 mg. daily, then 12 mg. daily, and finally, for a period of one month, nearly 20 mg. of fluoride were ingested daily. During this entire period he analyzed his total urinary (and fecal) excretion day by day and was able to show that the urinary excretion of fluoride was a simple straight line function of the intake. Specifically, approximately half of the fluoride absorbed each day was excreted in the urine. It is probable that when humans ingest smaller amounts of fluoride, such as 1 ppm, over a period of years, the daily urinary excretion is a greater fraction of the intake.

The extraordinarily rapid and efficient urinary excretion of fluoride is attributable to a somewhat lower resorption in the kidney tubule than is characteristic of chloride.

## BONE DEPOSITION

Bone and tooth substance normally contain small amounts of fluoride. The amount present in the hard tissues probably depends directly on the amounts of fluoride that have been taken into the body day after day; certainly the amount increases in a regular fashion with age. For example, in persons who were lifelong residents of Rochester, the average fluoride content of selected bones, such as rib or vertebra, increased in a nearly linear fashion from about 200 ppm of fluoride in the bone ash of 10 to 20 year olds, to about 1,200 ppm at ages 80 to 100.[5] These people had drunk water containing probably about 0.06 ppm of fluoride in the prefluoridation days in Rochester. There are no systematic data on the concentrations of fluoride in the skeletons of persons who have been lifelong residents of regions where the drinking water contains elevated amounts of fluoride. Isolated data are available, however, on the bone fluoride contents in industrial fluoride exposures; values as high as 10,000 ppm of fluoride have been recorded.

The mechanism of the deposition of fluoride in bone when the fluoride is given at low concentrations such as would occur from drinking fluoridated water has been elucidated. Fluoride deposits by a simple ionic exchange in which fluoride from the extracellular fluid exchanges with hydroxyl groups of the surface of the bone crystals.[6] Bone crystals have a hydroxyapatite crystal lattice in which calcium, phosphate and hydroxyl groups occupy well-defined positions. The hydroxyl ion and the fluoride ion are of the same size, have the same negative charge and can substitute one for the other. The hydroxyl ion is a more stable occupant of the site, but if sufficient

4. Largent, E. J., and Heyroth, F. F. Absorption and excretion of fluorides; further observations on metabolism of fluorides at high levels of intake. J. Indust. Hyg. & Toxicol. 31:134 May 1949.

5. Smith, F. A.; Gardner, D. E., and Hodge, H. C. Age increase and fluoride content in human bone. (Abst.) Federation Proc. 12:368 March 1953.

6. Neuman, W. F., and others. Surface chemistry of bone; fluoride deposition. J. Biol. Chem. 187:655 Dec. 1950.

fluoride ions are present, fluoride replaces hydroxyl. In effect, the surface of the crystal is converted into the fluorapatite lattice instead of the hydroxyapatite lattice. These two lattices, however, are nearly identical, and there is no indication that bone mineral with the fluorapatite lattice has any notable biological disadvantages.

Fluoride is not deposited irreversibly in the bone. It is true that the removal from bone is slow, and it is probable that the removal involves reworking and remodeling of bone carried on by the haversian systems and involving osteoblastic and osteoplastic activity. Of the available quantitative data, the best are those of Largent. In the experiment previously described,[4] he ingested fluorides systematically over a period of many months and kept track of how much fluoride entered his body and how much was excreted. It is therefore possible to calculate that at the end of the experimental period he had stored in his skeleton 1.7 Gm. of fluoride. In the months following, the fluoride excretion was analyzed day after day. In the first month, more of the stored fluoride was excreted than appeared during the third to fourth month. Subsequent examinations after a year and again after two years showed that the excretion of fluoride decreased in a simple linear fashion when plotted on the basis of the logarithm of the percentage stored. This relation permits the calculation of what might be called a "biological half-time," that is, the period required to mobilize and remove from the body half of the skeletal fluoride. This "biological half-time" is longer than a year and perhaps as long as two years. The removal, therefore, is slow but predictable and presumably is related to normal physiological processes in the skeleton.

In summary, it can be stated that skeletal deposition of fluoride is a continuing process in which a considerable portion of the ingested fluoride, perhaps a quarter or as much as a half, is deposited in the skeleton. Stored fluoride is mobilized only slowly.

## ACUTE FLUORIDE POISONING

Accidental or homicidal poisonings by fluoride are well known. Following a certainly lethal dose of fluoride (probably 5 to 10 Gm. of sodium fluoride), signs of violent gastrointestinal irritation, such as nausea, vomiting and diarrhea, are promptly seen. A shocklike state develops, and the victims usually die between two and four hours after ingesting the fluoride. Survivors after four hours usually live. The means of excretion of fluorides from the body by the kidney or by deposition in the bone are so effective and so prompt that if the concentration does not overwhelm the cellular processes, excretion thereafter reduces fluoride concentration to a level that is no longer lethal. Since 5 to 10 Gm. of sodium fluoride contain 2.5 to 5 Gm. of fluoride (2,500 to 5,000 mg.), and since by drinking a quart of fluoridated water at 1 ppm daily involves the ingestion of 1 mg. of fluoride, there is at least a 2,500-fold factor of safety against acute fluoride poisoning.[7]

Sometimes the question is raised, What would happen if there were a mechanical breakdown at the fluoridation plant and all of one day's supply of sodium fluoride or sodium silicofluoride were suddenly dumped into the water. If this large weight of fluoride could be dissolved, mixed and distributed within an hour, there would still be a factor of safety sufficient to predict that the water could be drunk for ten years or more without serious toxic consequences. For Rochester, N. Y., to add enough fluoride to the water supply so that a quart would contain a deadly amount, 400 tons of fluoride

7. Hodge, H. C., and Smith, F. A. Some public health aspects of water fluoridation. In Fluoridation as a public health measure, Shaw, J. H., editor. Washington, D. C., American Association for the Advancement of Science, 1954.

would have to be dissolved in the volume of water distributed each day. The machine used in Rochester has a hopper that contains only a half a ton; it is clearly impossible to produce acute fluoride poisoning by water fluoridation.

### CRIPPLING FLUOROSIS

First described as an industrial disease, crippling fluorosis, as the name implies, so hinders the function of a workman that he is unable to carry on his daily work. Crippling fluorosis is characterized by a "poker back," a stiffening of the back, traced to the calcification of the broad ligaments of the back. The workman is crippled because he can no longer bend over to pick up tools or to do simple manual jobs. Crippling fluorosis occurs when men ingest or inhale 20 to 80 mg. of fluoride or more daily for a period of 10 to 20 years. Since 5 gallons of fluoridated water (at 1 ppm) contain 20 mg., it is obvious that crippling fluorosis can never be produced by drinking fluoridated water.

When teeth are treated topically using a solution of sodium fluoride, that is, at 2 per cent, the total amount of fluoride applied to the teeth (which under extraordinary circumstances might be ingested) could be as large as 20 mg. If this fluoride were absorbed, it would mostly be excreted in the urine during the succeeding 24 hours. There would be no detectable effects from such a dose. It would be necessary to apply this amount or more to the teeth and to ingest it daily for 10 to 20 years to evoke crippling fluorosis. It is obvious that there is no danger from ingesting fluoride applied topically to the teeth.

### OSTEOSCLEROSIS

The condition of osteosclerosis, a hypercalcification detectable by roentgenographic examination, has been repeatedly described in persons with excessive fluoride intakes. This hypercalcification has not been associated necessarily with any loss of function or other ill effects. In the population of Bartlett, Texas, for example, where drinking water contained 8 ppm of fluoride (F), 13 of 114 lifelong residents drinking this water showed some osteosclerosis.[8] In industrial populations, Irwin[9] has come to the conclusion that if the urine contains less than 5 mg. per liter (presumably indicating a fluoride intake of less than 5 to 10 mg. per day), osteosclerosis never develops. On this basis, it can be predicted that persons drinking fluoridated water and excreting approximately 1 mg. of fluoride per day will never develop demonstrable osteosclerosis.

### MOTTLED ENAMEL

Enamel hypoplasia appears with graded severity when the drinking water contains 2 to 5 ppm of fluoride (F) or more. The degree of mottling is not a uniform one from child to child, but has a statistical distribution such that an occasional child will show this effect at 2 ppm and an increasing percentage of the children will show mottling as the fluoride content increases. It should be recalled that enamel hypoplasia (dental fluorosis) can only be produced during the first eight years of life when the enamel-forming cells are functioning.

Predictions of the factor of safety against mottling involve to some extent a knowledge of the variation in water drinking of children up to eight years of age. Very little is known about the water drinking habits of children. The guarantee of safety comes from communities where water supplies naturally bear fluorides. In these communities presumably may be found all of the possible

8. Leone, N. C., and others. Roentgenologic study of a human population exposed to high-fluoride domestic water. Am. J. Roentgenol. 74:874 Nov. 1955.
9. Irwin, Dudley. Personal communication.

variability in water drinking habits. The demonstration that in 10 to 12 year old children of these communities, the severity of mottling has a predictable dependence on the fluoride content of the drinking water constitutes an extraordinary basis for the prediction that when water is fluoridated artificially there will be the same incidence of enamel hypoplasia for a given fluoride level in the drinking water. Enamel hypoplasia has been shown to be minimal when drinking water contains 1 ppm of fluoride. It is therefore judged that there is a twofold to fivefold factor of safety against mottled enamel when populations drink artificially fluoridated water (1 ppm).

### HEART DISEASE

In certain statistics gathered by the Department of Public Health of the State of Illinois[10] are given the best evaluation to date of the general health of populations taking in small amounts of fluoride in the drinking water. The conclusion was reached that "there is no significant difference in the risk of death from specific diseases such as heart, cancer, nephritis and diabetes." Bishop, Richardson and Muhler[11] recently described a depressor effect on the blood pressure of normal dogs when a milligram of fluoride was administered intravenously. The intravenous administration to human beings of a comparable dose on a body weight basis would mean that a blood level of perhaps 100 micrograms per hundred milliliters of blood would be obtained. Such a value is about 25 times as high as the blood levels actually found in persons drinking fluoridated water containing 1 ppm of fluoride. There seems to be, therefore, an adequate factor of safety against such vasomotor effects.

### THYROID

From time to time reports appear of fluoride influences on the thyroid gland. These reports gain plausibility from the selective concentration of iodine in the thyroid gland. The study of small animals (rats) given doses of radioactive fluorine has revealed that small amounts of fluoride go to the thyroid gland. In one study, for example, 90 minutes after the administration of the radioactive fluoride, a total of 213 counts per minute were found in the thyroid gland.[12] This activity may be contrasted with the total of 385 counts found in the submaxillary and sublingual salivary glands or the 155 counts in the adrenal glands. Evidently, although the thyroid gland takes up some fluoride, there is no such concentrating ability as with iodine. Other organs in the same rat contained much more radioactive fluoride; the kidney contained 34,075 counts, the liver, 9,500, and the bone, 5,175 counts per minute. Histological thyroid changes have been produced, but always as a result of large doses of fluoride.

### KIDNEY DISEASE

Because the kidney is important in excreting fluoride, the question has repeatedly been asked whether kidney disease might impair fluoride excretion and thereby constitute a health hazard to the individual. Large doses of fluoride (near the acute toxic dose) produce a specific kidney injury of the columnar tubule cells. Small doses have no detectable kidney effect. For persons drinking fluoridated water, there is no evidence of adverse kidney effects of the fluoride thus consumed. The Department of Health of the State of Illinois specifically found no increase in risk of death by nephritis.

10. Health statistics bulletin, special release no. 20, 1952. Springfield, Ill. Bureau of Statistics, Illinois State Department of Health, 1952.

11. Bishop, J. G.; Richardson, A. W., and Muhler, J. C. Effect of different fluorides on vascular tone and alteration in the rate of blood flow. J. D. Res. 34:478 Aug. 1955.

12. Hein, J. W.; Smith, F. A., and Brudevold, F. Distribution of 1 ppm fluoride as radioactively tagged NaF in soft tissues of adult female albino rats. (Abst.) J. D. Res. 33:709 Oct. 1954.

In an animal experiment by Smith, Gardner and Hodge,[13] rabbits were given doses of uranium sufficient to cause severe kidney injury, almost enough to be fatal. This injury develops almost solely in the renal tubule cells. These rabbits and an equal group of control rabbits were given a drinking water supply containing 15 ppm of fluoride for a period of 42 days. The daily intake and excretion were measured for each rabbit individually. At the end of the test, it was shown that the control rabbits and the rabbits poisoned by uranium had excreted almost identical fractions of the fluoride ingested, that is, 45 to 48 per cent, respectively. No difference in the renal handling of fluoride was found in the rabbits tested, even in the presence of severe chemical nephritis.

Additional observations have been made on two groups each comprising about a dozen elderly patients of a county hospital, one with normal kidney function which served as a control group and the other an equal group of patients with long-standing kidney disease.[13] Urine samples were analyzed before water fluoridation and again after water fluoridation was begun. There was no difference in the range of concentrations of fluoride in the urine of the normal patients and the urine of the nephritic patients. After water fluoridation, more fluoride was found in the urine of both groups; again the values showed considerable variation and again the ranges overlapped.

With the limited amount of evidence at hand, it can be said that there is no known evidence that kidney disease is worsened or makes water fluoridation any more of a problem to the individual. Even if kidneys did not excrete any fluoride whatsoever and a person drank fluoridated water for a period of 70 years, all the fluoride thus ingested would only convert a quarter of the total mineral of the skeleton into fluorapatite. Such conversions have been seen in experimental animals without any evidence of loss of function or ill health.

## CANCER

Recurrent statements about fluorides in cancer perhaps deserve a word of comment. First, the statistics of the Department of Public Health of the State of Illinois should be referred to. No evidence was found of a difference in the risk of death from cancer when the drinking water of the community contained small amounts of fluoride. The reports by Alfred Taylor, a biochemist at the University of Texas, on the increased incidence of cancer in mice drinking fluoride-treated water have been shown to be unfounded since the food that he was giving the mice had many times the fluoride content of the drinking water and the food was supplied both to the control and experimental groups.[14] Subsequent tests did not confirm the differences. An additional piece of Public Health data may be cited.[7] In New England where water supplies contain little or no fluoride, the average incidence of breast cancer is 17 per hundred thousand. This rate can be contrasted with the incidence in Texas where many water supplies contain 3 or more ppm of fluoride; the average rate is only seven per hundred thousand. There is no indication that the risk of death by cancer is increased by drinking fluoridated water.

## SUMMARY

Studies of the metabolism of fluoride help in understanding the rapid disappearance of fluoride from the body after ingestion and the appearance of fluoride in the

13. Smith, F. A.; Gardner, D. E., and Hodge, H. C. Investigations on the metabolism of fluoride. III. Effect of acute renal tubular injury on urinary excretion of fluoride by the rabbit. A.M.A. Arch. Indust. Health 11:2 Jan. 1955.

14. Taylor, E. Facts relative to rumors that fluoridation is harmful. Texas D. J. 69:381 Sept. 1951.

bones and teeth. When all the evidence is put together, it may be concluded that in water fluoridation adequate factors of safety exist against the known toxic effects of fluoride. Additional studies are needed of population groups that have been for many years drinking fluoridated water. At present, the evidence does not justify the postponement of water fluoridation.

# Newburgh-Kingston caries-fluorine study XIV. Combined clinical and roentgenographic dental findings after ten years of fluoride experience

*David B. Ast,* D.D.S., M.P.H.; David J. Smith,† D.D.S.; Barnet Wachs,‡ D.D.S., and Katherine T. Cantwell,§ Albany, N. Y.*

Among the important questions which have to be answered when a new public health practice is considered are (1) the need for this new practice, (2) its safety, (3) its practicability and (4) its effectiveness. The literature during the past two decades has reported numerous surveys which have demonstrated the magnitude of dental caries prevalence and the yearly incidence rates.[1] The inadequate means which are available to cope with this problem have also been reported.[2] The previous authors have discussed the practicability and safety of community water fluoridation as a prophylactic program for the partial control of new dental carious lesions. I shall try to demonstrate the degree to which a community water fluoridation program has contributed to the control of this disease.

Between June 1944 and February 1946, clinical dental examinations were made for all of the elementary grade school children aged 6 to 12 in both the public and parochial schools in Newburgh and Kingston, N. Y. All the examinations at that time were made by one staff dentist using the classic mouth mirror and explorer technic. The recording was made according to an established classification which provided for caries-free teeth, untreated caries, filled, missing and unerupted teeth. Each tooth on the chart had some notation to indicate its status (Fig. 1).

Presented as part of a symposium, "Newburgh-Kingston caries-fluorine study: final report," at the New York Institute of Clinical Oral Pathology, Inc., New York, December 12, 1955.

*Director, Bureau of Dental Health, New York State Department of Health.

†Associate research dentist, Bureau of Dental Health, New York State Department of Health.

‡Senior dentist, Bureau of Dental Health, New York State Department of Health.

§Biostatistician, Division of Medical Services, New York State Department of Health.

1. National Academy of Sciences—National Research Council. Survey of the literature of dental caries. Publication 225. Washington, D. C., National Academy of Sciences, 1952.

2. Klein, H., and Palmer, C. E. Disparity between dental need and dental care in school children of Hagerstown, Md., and environs. J.A.D.A. 28:1489 Sept. 1941.

The initial dental examinations which were made in 1944-45 in Newburgh and in 1945-46 in Kingston demonstrated close comparability of dental caries experience among the children aged 6 to 12. The age-adjusted DMF rate in these base line examinations was approximately 20 DMF teeth per hundred permanent teeth in both Newburgh and in Kingston. With regard to first permanent molars, the rate was approximately 58 DMF first molars per hundred erupted first molars in each city.[3]

The community water supplies at the time of these examinations were both fluoride deficient, Newburgh's supply having 0.12 ppm fluoride (F) whereas Kingston had 0.05 ppm fluoride (F).

On May 2, 1945, Newburgh's water supply was supplemented with sodium fluoride to bring its fluoride ion concentration up to 1.0 to 1.2 ppm, and this concentration has been continuously maintained since then. Kingston's supply has remained fluoride deficient throughout the study period.

Annual clinical dental examinations for children in Newburgh were made in each of the years 1944-1945 through 1954-1955 and in Kingston from 1945-1946 through 1954-1955. In addition to the clinical examinations, roentgenograms were included in the examinations for the years 1949-1950, 1953-1954 and 1954-1955.

Progress reports were published after three,[3] four,[4] six[5] and eight[6] years of fluoride experience in Newburgh. All reports showed a continuing downward trend in caries experience among the

3. Ast, D. B.; Finn, S. B., and McCaffrey, I. Newburgh-Kingston caries-fluorine study. I. Dental findings after three years of water fluoridation. Am. J. Pub. Health 40:716 June 1950.

4. Ast, D. B.; Finn, S. B., and Chase, H. C. Newburgh-Kingston caries-fluorine study. III. Further analysis of dental findings including the permanent and deciduous dentitions after four years of water fluoridation. J.A.D.A. 42:188 Feb. 1951.

5. Ast, D. B., and Chase, H. C. Newburgh-Kingston caries-fluorine study. IV. Dental findings after six years of water fluoridation. Oral Surg., Oral Med. & Oral Path. 6:114 Jan. 1953.

6. Ast, D. B., and others. Newburgh-Kingston caries-fluorine study. VIII. Combined clinical and roentgenographic dental findings after eight years of fluoride experience. J.A.D.A. 50:680 June 1955.

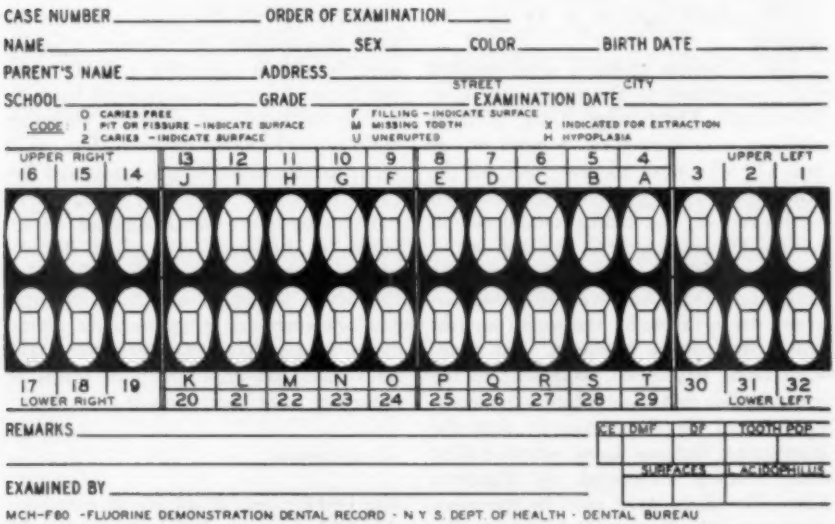

CASE NUMBER
ORDER OF EXAMINATION
NAME
SEX
COLOR
BIRTH DATE
PARENT'S NAME
ADDRESS
STREET
CITY
SCHOOL
GRADE
EXAMINATION DATE
CODE: 0 CARIES FREE; 1 PIT OR FISSURE - INDICATE SURFACE; 2 CARIES - INDICATE SURFACE; F FILLING - INDICATE SURFACE; M MISSING TOOTH; U UNERUPTED; X INDICATED FOR EXTRACTION; H HYPOPLASIA
UPPER RIGHT
UPPER LEFT
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J I H G F E D C B A
17 18 19 K L M N O P Q R S T 30 31 32
20 21 22 23 24 25 26 27 28 29
LOWER RIGHT
LOWER LEFT
REMARKS
EXAMINED BY
CE DMF DF TOOTH POP
SURFACES ACTIVE LESIONS
MCH-F80 -FLUORINE DEMONSTRATION DENTAL RECORD - N Y S. DEPT. OF HEALTH - DENTAL BUREAU

*Fig. 1 • Dental examination chart used in Newburgh-Kingston Caries-Fluorine Study*

Newburgh children, whereas the reports showed little change in caries experience among Kingston children.

## SCOPE OF REPORT

The tabulations and analyses of the data presented here are based on the dental findings after ten years of water fluoridation in Newburgh compared with data from fluoride-deficient Kingston. Both clinical and roentgenographic dental examinations were made for 2,024 children in Newburgh who were 6 to 14 years of age and 115 who were 16 years old. These children were selected by taking every second child in the specified ages who was enrolled in the school census and who was present in class on the day of examination. Both the public and parochial schools were included. This report, however, is based only on those children who had been in continuous residence in Newburgh since May 2, 1945, or who had been born there subsequent to that date and lived continuously in Newburgh to the time of the examination. Of this latter group there were 1,519 children aged 6 to 14 and 109 aged 16.

The Kingston children were selected for examination in the same way as in Newburgh. There were 2,021 of these children who were 6 to 14 years of age and 119 who were 16 years old. All the Kingston children examined are included in this report. The clinical dental examinations all were made by the staff senior dentist, (B.W.) between October 1954 and June 1955. The intraoral roentgenograms were taken by the senior dentist and a staff dental hygienist. The films, after being developed, were sent to the central office in Albany where statisticians randomized the film series so that the interpreters did not know whether they were reading Newburgh or Kingston films. The films were read by the associate research dentist (D.J.S.) and the senior dentist and recorded on new examination record cards which were then matched with the clinical records. The additional observations were added to the clinical records in red so that they could be distinguished from the clinical observations.

The data are combined for six to nine year old children because these children in Newburgh had used fluoridated water throughout their lives. The 10 to 12 year old children, who were under two years of age in 1945, had used fluoridated water during the partial calcification of the crowns of the first permanent molars and throughout the calcification of the second permanent molar crowns. The 13 to 14 year old children were three to four years of age in 1945 and drank fluoridated water in the postcalcification period of the first molar crowns but prior to eruption of these teeth and throughout the calcification of the crowns of the second permanent molars. The 16 year old children were six years old in 1945, and they were first exposed to fluoridated water when their first permanent molars were erupting and the crowns of their second molars almost fully calcified.

DMF rates may be based either on the tooth population as the universe, in which case the rate is expressed as DMF teeth per hundred erupted permanent teeth, or it may be expressed as DMF teeth per child or per hundred children. The use of teeth as the universe was preferred because individual teeth may be subjected independently to the hazard of caries. Caries is different from other diseases such as measles or scarlet fever in which the whole person is subject to the disease; however, since many other dental caries studies have expressed the DMF rates based on children, both forms of reporting have been included.

## FINDINGS

The DMF rates for the six to nine year old children in Newburgh show 57 to 58 per cent less dental caries experience than

**Table 1** • DMF[1] teeth per 100 erupted permanent teeth in children ages 6–16, based on clinical and roentgenographic examinations, Newburgh[2] and Kingston, N.Y., 1954–1955

| Age[3] | Number of children examined | | Number of permanent teeth erupted | | DMF per 100 erupted permanent teeth[4] | | |
|---|---|---|---|---|---|---|---|
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Per cent difference K-N |
| 6–9[5] | 734 | 940 | 6,861 | 9,231 | 10.0 | 23.1 | −56.7 |
| 10–12 | 522 | 640 | 11,139 | 13,888 | 15.4 | 32.2 | −52.2 |
| 13–14 | 263 | 441 | 7,123 | 11,989 | 22.5 | 43.0 | −47.7 |
| 16 | 109 | 119 | 3,054 | 3,330 | 34.8 | 58.9 | −40.9 |

1. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
2. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
3. Age (last birthday) at time of examination.
4. Adjusted to permanent tooth population in Kingston 1954-1955 examinations.
5. Newburgh children of this age group exposed to fluoridated water from time of birth.

do the rates for children of comparable age in Kingston. Among the 10 to 12 year old children, the differences are 52 to 53 per cent and the 13 and 14 year old children show 48 per cent difference, whereas the 16 year old children show a difference of 41 per cent (Tables 1 and 2). These data are based on the combined clinical and roentgenographic examinations.

In Table 3 are recorded the DMF rates observed on clinical examination only and the combined clinical and roentgenographic rates. The percentage difference of DMF teeth detected by roentgen ray and not found on clinical examination is appreciably higher in each age grouping for both Newburgh and Kingston. This increment, however, was more than twice as great in Kingston for ages six to nine and 10 to 12 than it was in Newburgh. At ages 13 and 14, it was 91 per cent higher, and at age 16, 49 per cent higher in Kingston than in Newburgh.

The first permanent molars are frequently used as an index of caries experience among children because this tooth accounts for the major incidence of caries in this group. Because this tooth erupts at about six or seven years of age and because of its morphology, it frequently succumbs to the hazard of caries early in life. In the Newburgh-Kingston Study, special attention was paid to the first

**Table 2** • DMF[1] teeth per 100 children ages 6–16, based on clinical and roentgenographic examinations, Newburgh[2] and Kingston, N.Y., 1954–1955

| Age[3] | Number of children with permanent teeth | | Number of DMF teeth | | DMF teeth per 100 children with permanent teeth[4] | | |
|---|---|---|---|---|---|---|---|
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Per cent difference K-N |
| 6–9[5] | 708 | 913 | 672 | 2,134 | 98.4 | 233.7 | −57.9 |
| 10–12 | 521 | 640 | 1,711 | 4,471 | 328.1 | 698.6 | −53.0 |
| 13–14 | 263 | 441 | 1,579 | 5,161 | 610.1 | 1,170.3 | −47.9 |
| 16 | 109 | 119 | 1,063 | 1,962 | 975.2 | 1,648.7 | −40.9 |

1. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
2. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
3. Age (last birthday) at time of examination.
4. Adjusted to age distribution of children examined in Kingston who had permanent teeth in the 1954-1955 examination.
5. Newburgh children of this age group exposed to fluoridated water from time of birth.

**Table 3** • DMF[1] teeth per 100 erupted permanent teeth[2] in children ages 6–16, based on clinical examination only and on combined clinical and roentgenographic examinations, Newburgh[3] and Kingston, N.Y., 1954–1955

| Age[4] | Newburgh | | | | Kingston | | | |
|---|---|---|---|---|---|---|---|---|
| | Clinical exam | Combined exam | Difference | | Clinical exam | Combined exam | Difference | |
| | | | Actual | Per cent | | | Actual | Per cent |
| 6–9[5] | 9.2 | 10.0 | +0.8 | +8.7 | 19.5 | 23.1 | +3.6 | +18.5 |
| 10–12 | 13.9 | 15.4 | +1.5 | +10.8 | 26.3 | 32.2 | +5.9 | +22.4 |
| 13–14 | 19.9 | 22.5 | +2.6 | +13.1 | 34.4 | 43.0 | +8.6 | +25.0 |
| 16 | 31.2 | 34.8 | +3.6 | +11.5 | 50.3 | 58.9 | +8.6 | +17.1 |

1. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
2. Rates are adjusted to the permanent tooth population in Kingston 1954-1955 examinations.
3. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
4. Age (last birthday) at time of examination.
5. Newburgh children of this age exposed to fluoridated water from time of birth.

permanent molars in each of the annual examinations and, as has been reported in each of the progress reports, there has been a continuing downward trend in DMF first molars in Newburgh.

The DMF first permanent molar rate was 53 per cent lower in Newburgh children ages six to nine, 30 per cent lower at ages 10 to 12, 14 per cent lower at ages 13 and 14 and 4 per cent lower at age 16 (Table 4).

Analyses of the several categories which make up the DMF total reveal that in each of the age groups studied, except at age 16, the rate for filled first molars was comparable for both cities. At age 16, Newburgh had a higher filled molar rate. Thus, for 94 per cent of the children studied, the amount of dental care was comparable in Newburgh and in Kingston. Among the six to nine year old children in Kingston, however, the proportion of first molars with untreated caries was three times as great, and the proportion of first molars missing was eight times as great, as noted among Newburgh children of the same age. At ages 10 to 12, the Kingston children had an 80 per cent greater proportion of untreated carious first molars and more than 4½ times as great a proportion of missing first molars compared to the Newburgh children. At ages 13 and 14, the Kingston children had more than a 33 per cent higher untreated caries rate and about a 70 per cent higher rate for missing first

**Table 4** • DMF[1] molars per 100 erupted first permanent molars in children ages 6–16, based on clinical and roentgenographic examinations, Newburgh[2] and Kingston, N.Y., 1954–1955

| Age[3] | Number first permanent molars erupted | | DMF first permanent molars | | Percentage first permanent molars DMF[4] | | |
|---|---|---|---|---|---|---|---|
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Per cent difference K-N |
| 6–9[5] | 2,605 | 3,390 | 635 | 1,808 | 25.1 | 53.3 | −52.9 |
| 10–12 | 2,088 | 2,560 | 1,320 | 2,305 | 63.2 | 90.0 | −29.8 |
| 13–14 | 1,052 | 1,764 | 847 | 1,660 | 80.7 | 94.1 | −14.2 |
| 16 | 436 | 476 | 399 | 453 | 91.5 | 95.2 | − 3.9 |

1. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
2. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
3. Age (last birthday) at time of examination.
4. Adjusted to the first permanent molar population in the Kingston 1954-1955 examination.
5. Newburgh children of this age group exposed to fluoridated water from time of birth.

Table 5 • Status of erupted first permanent molars in children ages 6–16, based on clinical and roentgenographic examinations, Newburgh[1] and Kingston, N.Y., 1954–1955

| Age[2] | Per cent of erupted first permanent molars[3] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Caries free | | DMF[4] | | Filled | | Untreated caries | | Missing | |
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston |
| 6–9[5] | 74.9 | 46.7 | 25.1 | 53.3 | 14.2 | 17.8 | 10.6 | 33.2 | 0.3 | 2.4 |
| 10–12 | 36.8 | 10.0 | 63.2 | 90.0 | 40.2 | 41.3 | 20.5 | 37.1 | 2.5 | 11.6 |
| 13–14 | 19.3 | 5.9 | 80.7 | 94.1 | 43.9 | 40.5 | 27.0 | 36.7 | 9.8 | 16.9 |
| 16 | 8.5 | 4.8 | 91.5 | 95.2 | 55.0 | 36.6 | 20.9 | 35.5 | 15.6 | 23.1 |

1. Sodium fluoride added to water supply beginning May 2, 1945.
2. Age (last birthday) at time of examination.
3. Adjusted to the first permanent molar population in the Kingston 1954-1955 examination.
4. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
5. Newburgh children of this age group exposed to fluoridated water from time of birth.

molars. At age 16 the Kingston children had about a 70 per cent higher rate of untreated carious first molars and a 48 per cent higher lost molar rate (Table 5 and Fig. 2).

An interesting comparison was made of the caries status of first and second permanent molars in Newburgh and Kingston children age 13, 14 and 16. The Newburgh children were three, four and six years of age, respectively, when first subjected to fluoridated water. As indicated previously, the crowns of the first molars of the 13 and 14 year old children were already calcified in 1945, and the first molars of the 16 year old children were either erupted or about to erupt at that time. In 1945, the second molar crowns of the 13 and 14 year olds were just about starting to develop but were about half developed for the 16 year old children.

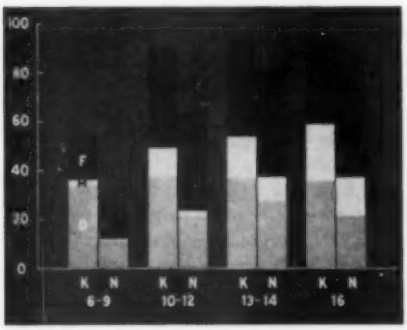



*Fig. 2 • Status of first permanent molars according to untreated caries (D), teeth lost (M), teeth filled (F), for children aged 6 to 16 in Newburgh and Kingston, 1954-1955*

The 13 year old children in Newburgh had a 15 per cent lower DMF rate in first molars and about 51 per cent lower rate in second molars than did the Kingston children. The percentage difference for the 14 year olds was 14 per cent for the first molars and 44 per cent for the second molars. For the 16 year olds the percentage difference was 4 per cent for first molars and 29 per cent for second molars (Table 6).

In the last published report on the dental findings in 1953-54, it was reported that there seemed to be a selective protection for proximal surfaces as compared with occlusal surfaces of teeth.[6] That report, while also based on both roentgenographic and clinical examinations, dealt with rather small groups of children (about 375 children ages six to ten in each city), and there was considerable difference in age distribution. Use of small numbers may preclude sufficient accuracy on which to make conclusive statements. At best, only a trend could be determined in that report, rather than definitive conclusions.

**Table 6** • DMF[1] molars per 100 erupted first and second permanent molars in children ages 13, 14 and 16, based on clinical and roentgenographic examination, Newburgh[2] and Kingston, N.Y., 1954–1955

| Age[3] | First permanent molars | | | | | Second permanent molars | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number erupted | | DMF per 100 erupted | | | Number erupted | | DMF per 100 erupted | | |
| | Newburgh | Kingston | Newburgh | Kingston | Per cent difference K-N | Newburgh | Kingston | Newburgh | Kingston | Per cent difference K-N |
| 13 | 632 | 948 | 79.3 | 93.0 | −14.7 | 531 | 821 | 26.9 | 55.1 | −51.2 |
| 14 | 420 | 816 | 82.4 | 95.3 | −13.5 | 408 | 741 | 39.0 | 69.9 | −44.2 |
| 16 | 436 | 476 | 91.5 | 95.2 | − 3.9 | 431 | 461 | 64.0 | 89.8 | −28.7 |

1. DMF includes permanent teeth decayed, missing (lost subsequent to eruption), or filled.
2. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
3. Age (last birthday) at time of examination.

In this current report there are substantially larger numbers of children in each of the age categories in both cities, and the previous impression regarding proximal and occlusal surfaces seems to be well founded. For the investigation of this factor the posterior permanent teeth (exclusive of third molars) were selected for analysis of carious surfaces. Since there is some difficulty in determining the origin of caries in instances of compound fillings or untreated compound carious lesions, only those posterior teeth in which there were clearly differentiable carious proximal and occlusal surfaces were used as the basis for study. A differentiable carious surface was defined as a proximal or occlusal surface with untreated caries or filling, clearly distinguishable in origin from adjacent occlusal or proximal surfaces respectively with untreated caries or filling.

The index used is that proportion of the total differentiable carious proximal and occlusal surfaces which are proximal surfaces. In all age groups, there was a significantly lower proportion of differentiable carious proximal surfaces in Newburgh than in Kingston.

In addition, the proportion of erupted posterior permanent teeth with differentiable carious occlusal surfaces and the proportion with differentiable carious proximal surfaces were obtained. For the six to nine year old group, the proportion of teeth with differentiable carious occlusal surfaces was about 40 per cent lower in Newburgh than Kingston. This rate is consistent with the much lower first permanent molar DMF rate in Newburgh at these ages. Since, at these ages, the first molars make up the entire proportion of the posterior teeth, this difference may be a reflection of the reduced DMF rate. At other ages no major difference seems to exist in these proportions in the two cities. It may be, however, that the greater proportion of compound carious lesions in Kingston at these ages has reduced these proportions which are based on differentiable carious surfaces only, to a point of similarity with those of Newburgh (Table 7).

In each age group, the proportion of erupted posterior permanent teeth with differentiable carious proximal surfaces, whether one or both surfaces are carious, is lower in Newburgh than in Kingston. This has been reflected in the proportion of differentiable carious surfaces which are proximal, as given previously.

As reported previously, the detection and correction of proximal caries is much more difficult than is occlusal caries. The data indicate, therefore, that in addition to the quantitative benefit which accrues from ingested water fluorides, that is, the reduction of DMF rates by about 60 per cent, there is also a qualitative benefit in that fluoridation is especially effective in

preventing those lesions which are most difficult to detect and to correct.

In three of the previous reports, the status of children with all the deciduous cuspids and deciduous molars present and caries free was studied.[4, 5, 6] Arbitrarily the deciduous incisor teeth were excluded because these teeth were in many instances exfoliated by the time the children were examined. On this basis those children who had all 12 of their deciduous cuspids and deciduous molars present and caries free were considered to be completely caries free insofar as their deciduous dentition was concerned. While this may be an arbitrary definition, it is a reasonable one because caries is rarely found in incisor teeth without a carious molar in the same mouth. This study was confined to the six to nine year old children because at these ages the children should normally have the deciduous cuspids and deciduous molars present. In Newburgh there were over five times as many children in this age group with all the specified teeth present and caries free as there were in Kingston (Table 8 and Fig. 3).

One of the arguments advanced against the fluoridation of water supplies is the potential danger of mottled enamel or dental fluorosis. Unfortunately the term mottled enamel is applied to all degrees of dental fluorosis. In its more severe forms it results in dental disfigurement; it was the endemic occurrence of this condition which led to the discovery of the relationship of ingested waterborne fluorides to caries prophylaxis. The severity of dental fluorosis is directly correlated to the concentration of the fluoride ion in the drinking water. In the milder forms of fluorosis the tooth enamel has a high luster which enhances the beauty of the teeth rather than disfiguring them.

A special study of dental fluorosis in Newburgh and Kingston was made by A. L. Russell, a Public Health Service officer with long experience in the detection of the mildest of such lesions. He examined 621 children aged 7 to 14 in Newburgh, of whom 438 had had continuous residence there since fluoridation started, and 612 children of the same ages in Kingston. Fluorosis was determined for each child according to the established classification by Dean,[7] in which the

7. Dean, H. T. Classification of mottled enamel diagnosis. J.A.D.A. 21:1421 Aug. 1934.

**Table 7** • Extent of differentiable caries[1] on occlusal and proximal surfaces of erupted posterior permanent teeth,[2] based on clinical and roentgenographic examinations of children ages 6-16, Newburgh and Kingston, N.Y., 1954–1955

| Age | Number of posterior permanent teeth erupted | | Per cent[3] of erupted posterior permanent teeth | | | | | | Per cent[4] of differentiable carious surfaces which are proximal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | With differentiable occlusal surface carious | | With one differentiable proximal surface carious | | With both differentiable proximal surfaces carious | | | |
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston |
| 6–9[5] | 2,786 | 3,837 | 14.9 | 24.4 | 1.0 | 3.8 | — | 0.1 | 5.5 | 14.1 |
| 10–12 | 5,623 | 7,081 | 17.5 | 17.1 | 1.6 | 6.3 | 0.2 | 0.7 | 9.8 | 31.2 |
| 13–14 | 4,013 | 6,749 | 18.5 | 20.8 | 2.6 | 10.4 | 0.1 | 2.5 | 13.8 | 42.6 |
| 16 | 1,735 | 1,880 | 24.2 | 21.9 | 3.4 | 13.2 | 0.4 | 3.6 | 14.8 | 48.2 |

1. Differentiable caries is here defined as untreated caries or filling on a proximal or occlusal surface, clearly distinguishable in origin from an adjacent occlusal or proximal surface (respectively) with untreated caries or filling.
2. Posterior permanent teeth consist of the eight bicuspids and eight molars.
3. Adjusted to the posterior tooth population in each age group in the Kingston 1954-1955 examinations.
4. Adjusted to the number of differentiable carious proximal and occlusal surfaces in each age group in the Kingston 1954-1955 examinations.
5. Newburgh children of this age group exposed to fluoridated water from time of birth.

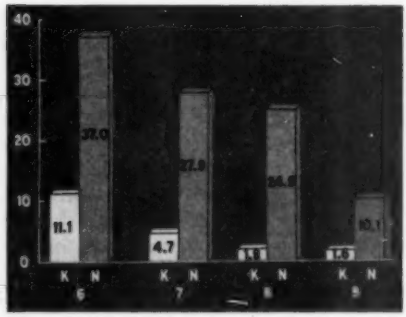



*Fig. 3 • Percentage of children ages six to nine with all their deciduous cuspids and deciduous molars present and caries free, Newburgh and Kingston, 1954-1955*

child is classified on the basis of the two teeth in his mouth showing the most advanced signs of fluorosis.

Enamel opacities due to causes other than fluoride exposure were also recorded for the children in both cities. In general, these other opacities are developmental hypoplasias. Distinction between opacities caused by fluoride exposure and developmental hypoplasias can be made by a trained examiner, and in some very few instances the two types of lesions may occur on the same tooth.

Among the 438 children with continuous residence in Newburgh, there were 46 children with questionable fluorosis, 26 children with very mild fluorosis and six with mild fluorosis (Table 9). There were no instances of moderate or severe mottling. The distinctions between questionable, very mild and mild fluorosis are based wholly on the extent of the tooth surface involved. In these three categories noted, the involvement consists of slight whitish flecks or opaque areas on the surface of the enamel without any breaks in surface continuity, excessive wear or staining. A trained eye is required to detect these stages of mottling, and the average dental practitioner would have difficulty finding them. None of these instances of dental fluorosis was disfiguring.

In Kingston 115 of the 612 children examined showed nonfluoride opacities, constituting almost 20 per cent of the children examined. In Newburgh there were 36 such children, or 8 per cent of the children studied. Most instances of these hypoplasias appear as circular white or colored patches in the enamel, and most of them are obvious even to the untrained eye. The relatively infrequent occurrence of nonfluoride opacities in Newburgh compared to Kingston tends to confirm a previous report that the intake of fluoridated water at the recom-

**Table 8** • Number and per cent of children age 6–9 with caries-free deciduous cuspids, first and second deciduous molars, based on clinical and roentgenographic examinations, Kingston and Newburgh,[1] N.Y., 1954–1955

| Age[2] | Number of children examined | | Number of children with all 12 teeth present and caries-free | | Per cent children with all 12 teeth present and caries-free | |
|---|---|---|---|---|---|---|
| | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh |
| 6 | 216 | 184 | 24 | 68 | 11.1 | 37.0 |
| 7 | 255 | 208 | 12 | 58 | 4.7 | 27.9 |
| 8 | 277 | 213 | 5 | 53 | 1.8 | 24.9 |
| 9 | 192 | 129 | 3 | 13 | 1.6 | 10.1 |
| Total | 940 | 734 | 44 | 192 | 4.7 | 26.2 |
| Adj. rate[3] | | | | | 4.7 | 25.5 |

1. Sodium fluoride added to Newburgh's water supply beginning May 2, 1945.
2. Age (last birthday) at time of examination. Newburgh children of these ages exposed to fluoridated water from time of birth.
3. Adjusted to the age distribution of Kingston children in the 1954-1955 examination.

mended concentration appears to reduce the hazard of hypoplastic spots on teeth.[8]

The same groups of children were examined and scored for gingival and periodontal disease, using the system and criteria established by Russell. Under this system, gingivitis is given a positive score only when it is flagrant and overt; this permits placing greater emphasis on advanced disease, and minimizes examiner bias. There was slightly, but significantly, more gingivitis in Kingston than in Newburgh children. Although there is no evidence that ingested water fluoride at the optimum concentration provides gingival protection, it is of significance that this fluoride intake is not associated with an increased prevalence of gingival disease.

## SUMMARY

The results of dental clinical and roentgenographic examinations of children in Newburgh and Kingston after ten years of fluoride experience in Newburgh have been reported.

The children ages six to nine in Newburgh who had been drinking fluoridated water all of their lives had a DMF rate for permanent teeth 58 per cent lower than in Kingston children of the same age.

The 10 to 12, 13 to 14 and 16 year old Newburgh children, who were not exposed to fluoridated water all of their lives but who had had continuous residence in Newburgh since May 2, 1945, had rates lower by 52 per cent, 48 per cent and 41 per cent respectively, compared with Kingston children of similar ages.

With regard to first permanent molars, the children who lived all their lives on fluoridated water had a DMF rate 53 per cent lower than the Kingston children of the same age. These Kingston children had three times as many first molars with untreated caries and about eight times as many first molars already lost because of caries than noted among the Newburgh children.

DMF rates for first molars among Newburgh children who did not have lifetime exposure to the fluoridated water compared with similar aged Kingston children were lower by 30 per cent in the 10 to 12 year old group, 14 per cent in

8. Zimmerman, E. R. Fluoride and non-fluoride enamel opacities. Pub. Health Rep. 69:1115 Nov. 1954.

**Table 9** • Enamel opacities among 438 Newburgh children ages 7–14 with continuous residence subsequent to May 2, 1945* and 612 children of the same ages in Kingston, N.Y.

| Age | Number of children examined | | No fluorosis | | Enamel opacities due to fluorosis | | | | | | Nonfluoride opacities | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Questionable | | Very mild | | Mild | | | |
| | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston | Newburgh | Kingston |
| 7 | 9 | 1 | 7 | 1 | 2 | — | — | — | — | — | 1 | — |
| 8 | 87 | 123 | 66 | 123 | 12 | — | 7 | — | 2 | — | 1 | 24 |
| 9 | 81 | 127 | 67 | 125 | 10 | 2 | 4 | — | — | — | 5 | 24 |
| 10 | 84 | 130 | 68 | 130 | 8 | — | 5 | — | 3 | — | 12 | 20 |
| 11 | 109 | 151 | 90 | 149 | 11 | 2 | 7 | — | 1 | — | 9 | 31 |
| 12 | 50 | 61 | 44 | 61 | 3 | — | 3 | — | — | — | 4 | 12 |
| 13 | 17 | 17 | 17 | 17 | — | — | — | — | — | — | 4 | 3 |
| 14 | 1 | 2 | 1 | 2 | — | — | — | — | — | — | — | 1 |
| Total | 438 | 612 | 360 | 608 | 46 | 4 | 26 | — | 6 | — | 36 | 115 |

* Fluoridation started in Newburgh on that date.

13 and 14 year olds and 4 per cent in those aged 16. The 10 to 12 year old children in Kingston had an 80 per cent higher untreated caries rate than Newburgh children, at ages 13 and 14 Kingston's rate was more than 33 per cent higher and at age 16 about 70 per cent higher. With regard to missing first molars, the Kingston children had more than 4½ times the Newburgh missing first molar rate at ages 10 to 12, about 70 per cent higher rate at ages 13 and 14 and 48 per cent higher at age 16.

The DMF rate for second permanent molars in Newburgh children aged 13 was 51 per cent lower than that for the Kingston children. At age 14, the Newburgh rate was 44 per cent lower and at age 16 it was 29 per cent lower.

The data based on DMF surfaces indicate that ingested water-borne fluorides at the optimum concentration affords selective protection for the proximal surfaces of posterior teeth in comparison with occlusal surfaces.

There were about six times as many children in Newburgh ages six to nine who had all their deciduous cuspids and deciduous molars present and caries free than noted in Kingston.

In a study of enamel opacities among children ages 7 to 14 in Newburgh and in Kingston, there was no evidence of any disfiguring mottled enamel among the Newburgh children. Forty-six Newburgh children had questionable fluorosis, 26 had very mild fluorosis and six had mild fluorosis. There were 115 children in Kingston who showed nonfluoride enamel opacities and 36 such children in Newburgh.

There was no evidence that drinking fluoridated water at the recommended concentration contributed to the hazard of gingivitis.

## COMMENT

This report cannot be concluded without an expression of gratitude to the members of the advisory committee. Their understanding of the numerous problems faced, their expert guidance and technical assistance and their enthusiasm played a major role in making this new public health practice a reality. Members of the committee were Harold C. Hodge, Ph.D., professor of pharmacology, University of Rochester, Rochester, N. Y., chairman; Katherine Bain, M.D., assistant to the chief for program development, Department of Health, Education and Welfare, Washington, D.C.; Henry L. Barnett, M.D., attending pediatrician, The New York Hospital, New York; Basil G. Bibby, director, Eastman Dental Dispensary, Rochester, N. Y.; John Caffey, M.D., attending roentgenologist, The Babies Hospital, New York; John W. Fertig, Ph.D., professor of biostatistics, Columbia University, New York; William J. Gies, Ph.D., professor of biological chemistry, Columbia University, New York, and Samuel Z. Levine, M.D., pediatrician-in-chief, The New York Hospital, New York.

The staff of the Newburgh-Kingston Caries-Fluorine Study are to be congratulated for a job well done and thanked for their cooperation. The staff was made up of David E. Overton, M.D., associate physician, pediatric research; Sidney B. Finn, associate research dentist; Barnet Wachs, senior dentist; Clara M. Briggs, public health nurse; Emma Rabineau, dental hygienist; James Gaddy, medical technician; Jayn Parker, clerk; Mary Peel, clerk; Theresa Costa, clerk, and Harold Gardener, dental assistant.

A special commendation must be given to the civic and school authorities in both Newburgh and Kingston for their cooperation which made this study possible; also to the staff at the Water Treatment Plant in Newburgh, who were responsible for the technical aspects of the fluoridation process and who did their job so well.

All concerned with the study are deeply grateful to the New York Institute of Clinical Oral Pathology for the interest

with which they organized the initial meeting in 1944 and the final one in 1955, to Edward S. Godfrey, former commissioner of health, Herman E. Hilleboe, commissioner of health of the New York State Department of Health and the central office staff of the New York State Department of Health, for their encouragement and assistance in making this study possible.

# Establishing just fees for patients

*Lloyd H. Dodd, D.D.S., Decatur, Ill.*

Many factors enter into the setting of just fees for patients. Consideration must be given to the value of the dental health service to the patient, the public welfare, fair remuneration to the dentist, prevailing fees in the community and the establishment of good public relations. Fees are only one factor to be considered in good practice administration, but an important factor meriting much consideration.

The recent graduate must first determine his cost of practice, that is, the cost of education and the cost of equipment. These are known factors. The fixed expenses such as rent and salary can only be estimated and cannot be determined definitely until the dentist has been in practice for two or three years. The total amount of the cost of education and equipment when added to the current office expenses and divided by office working hours will give the hourly overhead. This amount should be amortized at approximately 4 per cent each year for 25 years, which is generally agreed to be the most productive period. The percentage of gross income that goes for overhead is estimated at 40 per cent.

When Sundays, holidays, vacations, conventions, illnesses and miscellaneous absences are subtracted, there remains an average of 250 working days per year. If the average productive hours are estimated at six per day, there are 1,500 productive hours per year, or approximately 125 productive hours per month.

The recent graduate should set up early in his career definite objectives—professional, social and financial—and should establish provisions for his continued education.

## QUESTIONS AND ANSWERS ON FEES

Many questions are asked concerning fees. Among those to be considered are the following:

*Q.* Should a thorough diagnosis be made before a fee is quoted?

*A.* Yes. A thorough diagnosis should be made, a complete history should be obtained and the patient's story should be heard. Much valuable information can be obtained thereby, particularly information concerning the patient's experiences with previous dentists and possible prejudices and fixed ideas.

*Q.* After the patient, who should be considered (besides the dentist) when the fee is quoted?

*A.* The dentist's dependents—his wife, children and others dependent on him.

Presented before the ninetieth Midwinter Meeting of the Chicago Dental Society, Chicago, February 9, 1955.

*Q.* How is a fee justified?

*A.* When the dentist's conscience tells him he has been perfectly fair with the patient and that he has rendered an adequate dental health service to the patient and in return has been properly compensated, the fee has been justified.

*Q.* On what is the fee based?

*A.* The fee is based on the type of dental health service rendered, the technical skill required and the time consumed.

*Q.* What determines the fee?

*A.* The cost of practice plus the salary which the dentist pays himself determines the fee.

*Q.* When establishing fees, what is the fair average estimate above the overhead on an hourly basis?

*A.* Two and a half times the overhead is considered fair and equitable. A variable hour fee would be justifiable. Some examples follow: low, $8; average, $10, and high, $12 per hour; or $10, $12 and $15 per hour, depending on the overhead and the type of dental health service rendered. Also the financial status of the patient and the standard of living required by the dentist should be considered.

*Q.* How can misunderstandings relative to fees be avoided?

*A.* The approximate fee should be determined by consultation between the patient and dentist prior to beginning the service.

*Q.* Should demonstrating models be used when presenting fees?

*A.* The use of models which give the patient an understanding of the service to be rendered is appropriate. The use of sample models for sales promotion is to be deplored.

*Q.* How should "shoppers" be handled in the dental office?

*A.* The patient's appreciation of values has much to do with fees. Some people shop on a fee basis whereas others are much more interested in seeking the best dental care and consider the fee incidental to the service. There are wealthy and poor people in both groups. Teaching the patient the value of dental health service should be attempted. A few so-called shoppers have ultimately proved to be valuable patients, although, as a rule, they are in the minority.

*Q.* After the approximate fee is stated, should the dentist insist on immediate acceptance or advise the patient to go home, think it over and talk it over with others concerned before acceptance?

*A.* He should advise the patient to take his time in deciding.

One question always asked by patients when considerable dental work is indicated is, "Is your plan of treatment worth the cost?" A forthright, affirmative answer by the dentist, followed by a thorough understanding between patient and dentist before beginning operations, is highly important. Acceptance should be mutual.

*Q.* Are itemized fees desirable?

*A.* They are not desirable although some dentists itemize all fees when sending out monthly statements, believing that the patient is better satisfied. A dentist should not be on the defensive concerning fees; if the patient desires to know how they are computed, the dentist should tell him.

*Q.* What is meant by a contingency fee?

*A.* A contingency fee is an addition to the quoted approximate fee to cover the unexpected—possible change of treatment, broken appointments and other difficulties—which may require more time and effort on the part of the dentist. Some dentists estimate this contingency fee from 10 per cent to 20 per cent above the quoted fee. Here again, a complete understanding with the patient in the beginning is important; if none of the contingencies arises, the basic fee is the only one rendered.

*Q.* Should the dentist provide any services at less than cost?

*A.* Under certain conditions, yes. Two types of patients might come under this provision: (1) charity cases that the dentist feels should be given due consideration and (2) professional people; for example, the dentist's own physician with whom he has a reciprocal agreement to the effect that professional services are extended each other and will be provided at less than cost. Professional courtesies are always appreciated by physicians and their families.

*Q.* Does the dentist grant an allowance or discount in fees for clergymen?

*A.* The dentist must use his own judgment. Although in past years it has been customary to grant a discount (approximately 10 per cent), if this discount is allowed all clergymen the sum could be considerable.

*Q.* What is the effect of the quality of service on fees?

*A.* Outstanding ability of the dentist in most circumstances should bring commensurately higher fees. The high type of health service should be a factor in regulating the fee. The dentist must constantly seek to increase his personal value to his profession and to his community. He certainly is entitled to financial and property resources comparable to those of other community leaders.

Attempts have been made to establish a scientific yardstick of values for each type of dental operation. In some instances, the public has been confused by the difference in fees in different parts of the country. Three key elements have been suggested as bases for the establishment of fees: (1) technical skill, (2) duration of the operation and (3) amount of postoperative care.

The increasing use of rate schedules by health insurance and compensation agencies brings into focus the startling and undesirable variation in fees charged by some professional people.

*Q.* What is the effect of productivity of the operator on fees?

*A.* The effect varies to the extent that some dentists require more time for given operations; for example, one dentist may require one full day for the preparation, insertion and finishing of a gold inlay. Either he must charge a higher fee for his services than that charged by the average and speedier operator in his community or he must be content with a smaller income.

*Q.* Is the establishment of a minimum fee schedule by dentists in a given community desirable?

*A.* It is desirable but not always practical. Certainly discussions of fees by members of the local dental society are highly desirable.

Minimum fee schedules should not be posted in a conspicuous place in the office.

*Q.* Is an hourly fee always fair?

*A.* It is not.

*Q.* Is a set fee always fair?

*A.* It is not. All fees should be on an individual basis, but within a limited range.

*Q.* Should the dentist have a sliding fee scale for a given operation; that is, should a dentist adjust his fee schedule for a given operation to the financial status of the patient or should he adjust his services to the financial status of the patient—for example, should he insert an amalgam filling in place of a gold inlay?

*A.* The busy practitioner must employ both types of adjustment. He must use his very best judgment in determining when the fee or the service should be adjusted in the best interests of the patient.

*Q.* Are more than two estimates per patient justifiable?

*A.* Seldom, although in some instances two or even three estimates may be fair, in the sense that if the original or ideal plan is not accepted, then, as Cecil Bliss has said, "We may have a compromise

suggestion and last, an alternative plan." Several estimates are confusing to patients; if one of these is selected, there always will be doubt in the patient's mind whether the proper plan was accepted.

*Q.* What does the *Principles of Ethics* have to say about rebates and split fees?

*A.* The dentist may not accept or tender "rebates" or "split fees."

*Q.* How do the dentist and patient face financial and technical difficulties?

*A.* The dentist and the patient can face financial and technical difficulties by means of a well managed consultation which leads to cooperation and mutual confidence. Consultation induces the patient to share responsibilities and to show a definite appreciation of what dental service will do for him, and minimizes misunderstandings.

*Q.* What are some dangerous results of exorbitant fees?

*A.* Exorbitant fees lead to (1) loss of confidence of the patient in the dentist, (2) loss of confidence of the patient in the profession and (3) provision of ammunition for social planners and opportunists who seek to socialize the professions.

*Q.* What are the dangerous results of a ridiculously low fee schedule?

*A.* People educated to the benefits of good dental health service, and who may have moved from one community to another, become suspicious when confronted with a dentist who has adopted an extremely low fee schedule.

*Q.* Is the Veterans Administration fee schedule fair in all communities?

*A.* It is not. A dentist in a small community, who had a low overhead, might obtain an inordinately high income if enough of the work was forthcoming, whereas a dentist practicing in a large metropolitan area, who had a large overhead, might go bankrupt; therefore, one fee schedule for all communities, large and small, is not fair.

*Q.* What are the two premises on which a dentist may recover fees through courts of law?

*A.* The dentist may make legal recovery (1) if he has a complete understanding with the patient as to the fee before beginning work and (2) if his fees are not out of line with prevailing fees in his community.

*Q.* Should fees ever be quoted over the telephone?

*A.* Absolutely not. Fees should be discussed in an open, frank and unhurried manner, preferably in the dentist's office so that there can be no misunderstanding on the part of either the dentist or the patient regarding the proposed fee.

*Q.* Are specialists entitled to higher fees than general practitioners?

*A.* Sometimes yes and sometimes no. The specialist's fee should pivot on one elementary question: Has he earned it?

*Q.* Should fees fluctuate like the stock market?

*A.* Absolutely not. Fees should be gradually adjusted to meet changing living conditions and should vary in different communities; however, that does not mean that they should spiral upward "for all the traffic will bear" nor should they nose-dive overnight.

*Q.* Should fees be charged for examinations?

*A.* Any worthwhile examination should justify a fee. The patient should not consider an examination a search for treatment, but rather a professional health service.

*Q.* Should fees be charged for broken appointments?

*A.* Appointments broken without ample notification should be charged for on the basis of the actual time lost. Many dentists do not charge for broken appointments because they claim that it disrupts the harmony of the office. Here again, an understanding should be reached beforehand. When appointments are broken inexcusably, the dentist is en-

titled to fair remuneration. When the patient has a legitimate excuse—for instance, illness, death in the family—he should not be charged for a broken appointment.

*Q.* What fees should be charged for children's dental work?

*A.* Generally, full fees are indicated for children; the parent, if properly educated to the value of this service, will appreciate the importance of proper care of the children's teeth. The dentist might well acquire the pediatrician's attitude toward the child.

*Q.* Should a fee be set for treatments for and stopping of toothaches?

*A.* A fee is justifiable in either instance and should be based on the time required and the responsibility and skill involved.

*Q.* Is the dentist justified in overcharging for prosthetic work at the expense of a good preventive service?

*A.* No, but unfortunately in some instances this is done. A good preventive service, however, should be the main objective of the conscientious dentist. The problem goes beyond fees for either. Future problems of prosthetics will be reduced when all dentists practice preventive dentistry through education and proper care of children.

*Q.* Are present dental fees too high in relation to the service performed?

*A.* On the average, no, inasmuch as average dental fees have not advanced in relation to the cost of living.

*Q.* Are dental fees too high when related to individual dental income?

*A.* On the average, no.

*Q.* What steps should the dental profession take to keep fees in line with the service rendered?

*A.* This problem should be discussed among dentists on the local level. The dentists should aim to adopt fees which will reflect credit on the individual dentist and the profession.

*Q.* Should a young dentist just starting practice, who shares an office with a dentist established in practice, quote fees higher than those charged by the dentist with whom he is sharing the office, especially for overflow patients referred to him by this dentist?

*A.* This would depend to a certain extent upon the fee schedule of the older dentist. If the older dentist's fees are too low, the younger dentist would be entitled to fees comparable to those prevailing in his neighborhood; if the older dentist's fees are average, the young dentist should become established before quoting fees higher than those of the dentist already established.

*Q.* 1. Should the young dentist consult the older man with whom he shares his office as to his fee schedule and, if not satisfied, frankly tell the older man that he plans to quote higher fees for given operations? 2. How can the young man justify the higher fee not only to the patient but to the senior dentist?

*A.* 1. The young dentist should consult with the older man as to his fee schedule. 2. The young man could only justify the higher fee by superior technical skill and the fee schedule in the neighborhood.

*Q.* In quoting fees for prosthetic work, should there be an understanding that this fee includes an agreement upon a period of time for adjustments and that at the expiration of this agreed time, there will be a fee for necessary future adjustment?

*A.* The dentist must decide each case individually. Biological factors and mechanical procedures are involved.

*Q.* On recalling denture patients for periodic checks for any physiological changes in the mouth, should there be a fee for this as well as an additional fee for any major adjustment of the denture which may be necessary?

*A.* The answer would depend on the original agreement with the denture pa-

tient. Although there may be some question as to the fee for the check-up, there should be no question as to the fee for a major adjustment.

*Q.* Is it advisable, when quoting fees for prosthetic service, to explain to the patient that an annual check-up is necessary?

*A.* Each case must be decided on its merits.

*Q.* Can the dentist assume that the patient understands that there will be a fee for this check-up, just as there is a fee for the semiannual or annual prophylaxis?

*A.* If the original agreement was to this effect, the answer would be, yes.

*Q.* How can a dentist justify an increase in fees to patients whom he has served for years, when this increase in fees is due to a move to a better location? Although the dentist has not necessarily improved his dental service as such, he has made it easier for his patients to reach him.

*A.* The dentist should explain this. The explanation would be acceptable to some regular patients and not acceptable to others.

*Q.* 1. When moving to a certain neighborhood, should a dentist endeavor to ascertain the fee schedule for that neighborhood or should he establish fees as an individual, basing them on known costs and so forth? 2. If his fees are higher than fees generally are, how does he justify the difference?

*A.* 1. He should consider both factors. 2. He could justify the higher fees by citing his outstanding technical skill.

*Q.* Is the use of a collection agency ever justified?

*A.* Only as a last resort and only if the collection agency is identified with a credit rating bureau.

*Q.* Should time spent by a dentist in education of a patient in the value of adequate dental care be charged to the patient at the rate for chair time or should this be the dentist's investment in the patient?

*A.* The answer would depend on the type of patient involved. If a "shopper" comes in for services based on fee alone, he should be charged at the rate of chair time. If a patient is taught the value of good dental health and accepts the dentist's recommendations, the time spent would prove to be a good investment in the patient by the dentist.

*Q.* Can the young dentist just opening an office charge a fee for consultation or should he invest this consultation time as the foundation on which he is building his practice? If he does not, at the start of his dental practice, have a fee for consultation, can he later charge a fee for this service?

*A.* First, the young dentist might well invest this consultation time as a foundation on which he builds his practice; later when he is established he might charge a fee.

*Q.* Is the dentist ever justified in comparing services he offers with those offered by some other dentist at a lesser fee?

*A.* No. The dentist must stand on his own professional prestige and should never place his services on the auction block.

*Q.* Should parents be charged chair time for a child's behavior habits when such habits reduce operating time to ten minutes, although the child has actually been in the operating room for 20 or 30 minutes?

*A.* Yes. Walter McBride has stated, "An operator encountering an unruly child at his first appointment soon loses interest on a fee per operation basis, but on a fee per hour arrangement has no concern except to make his patient tractable."

*Q.* What kind of patient should be viewed with slight suspicion on his first visit?

*A.* The new patient who does not seem interested to ascertain the approximate fee before the work is begun. Some persons are not concerned to learn the fee until after services are rendered, for the purpose of using their ignorance as to the size of the fee as an excuse for controversy and consequent evasion.

SUMMARY

Fair fees breed confidence. Fair fees measured on the basis of high skill, discipline—the will to do one's best with full knowledge of the requirements of the task at hand—may be established on a high level. The patient should be taught the benefits to be derived from optimum dental health, the importance of the dental health services being rendered and what may be expected in terms of health and well being as well as the limitations that may be forthcoming. A level of fees which allows quality service in all instances, even though not complete service, which allows the dentist and his family to live on at least the average scale of the patients in the community he serves, should be regarded as minimum, fair and just.

Finally, when a just fee is being quoted for patients, the dentist should ask himself this question: Would I be willing to pay a like fee for the same service, knowing what I do about dentistry?

*860 Citizens Building*

*Big Dividends from Research* • In dollars and cents, how much does society get back for its investment in research and development? Raymond Ewell of the National Science Foundation recently examined this question. . . . Reasonable assumptions led to the estimate that in the United States the return averages from 100 to 200 per cent a year for 25 years. Over the course of 25 years, society gets back $2,500 to $5,000 for every $100 spent on research and development. Some of Ewell's figures are pretty speculative, but even if there is a large error in the estimated return, research and development appears, on a strictly financial basis, to be a first-class investment. Confirmation came from a chemical company and an oil company that had independently estimated their returns at 200 and 160 per cent per year, respectively. . . . A broker, apparently assuming we have money to invest, has recently been favoring us with persuasively written descriptions of the future prospects of a number of common stocks. Imagine the prospectus that could be written on the basis of Ewell's calculations if *Research and Development Unlimited* was listed on the New York Stock Exchange. *Editorial, Science, 122:581 Sept. 30, 1955.*

# *Cases and Comments*

## DENTOFACIAL PAIN

*By Harry Cimring, D.D.S., Los Angeles.*

In 1948 a 25 year old woman was seen because of pain in the left side of her tongue, pain so severe at times that she would refrain from talking so as not to aggravate it.

Ten years previously she had undergone orthodontic treatment for the correction of a lingually-impacted upper left cuspid and a deep overbite. Her four third molars and two lower second molars were congenitally absent. On the advice of a dentist, her two upper second molars had been extracted on the theory that, without opposing teeth, it were better that they be removed.

Two plastic appliances were placed to present a smooth lingual aspect to the tongue, and it was suggested that she seek medical advice relative to a possible pathosis in the mucosa of the tongue.

On medical advice, she went into psychoanalysis (three years, 1949-1952) on the assumption that the pains might be psychogenic in origin. After six months of this treatment the plastic appliances were discarded as some relief was experienced. The pains persisted, however, extending from the tip along the entire left side of the tongue and were felt deep in the organ.

From February to June 1952 "shooting" pains in the upper and lower left molars were experienced.

In June the "fiery, electric, hot" pains spread to the cheek, around the mouth, along the gingival margin, to the tongue and teeth, all on the left side. The "seizures" would start while the patient was eating, talking or brushing the teeth, forcing her to remain "frozen" in one position until the attack ended.

As emotional factors were not related to these new pains, the psychoanalyst suggested that analysis be discontinued and the advice of a neurosurgeon sought.

Meanwhile the patient was given trichloroethylene and, later, phenylbutazone (Butazolidin). She was given vitamins daily. At first the daily vitamin injection afforded relief but eventually proved ineffectual.

In October 1952 the pain pattern changed from "shooting" sensations to "contracting" ones, lasting 5 to 30 minutes each and extending to the temple. During this period, a lower infected molar was extracted. In January 1953 an attack lasted for almost three days. In May 1953 a series of 12 attacks necessitated hospitalization of the patient. An electroencephalogram was normal. Several neurologists and neurosurgeons were consulted, but their diagnoses and proposals were conflicting.

The pain spread to the top of the head and forehead. An upper molar with a pulp stone was extracted in hope of relief. In 1953, during pregnancy, the patient experienced a measure of relief from pain.

In 1954 and early 1955 the pain continued in various forms and intensity. A sweat test for function of the sympathetic nerves was negative. Allergy tests were negative. Procaine nerve blocks were tried, cobra venom injections given and hydrocortisone was used. The patient was hospitalized twice during severe attacks. Various sedatives and hypnotics were prescribed. The upper left cuspid (somewhat weak on response to pulp testing) was extracted. Many roentgenograms of the head were taken and were negative. Traction gave no relief.

In mid-1955, a neurosurgeon suggested that the patient be surveyed for temporomandibular articulation dysfunction. Roentgenograms of the joint were negative. A plastic splint was placed to relieve an "abnormal muscular pattern" on the left side, without much effect. At the neurosurgeon's suggestion the jaws were wired together for two weeks; the patient experienced no relief.

The neurosurgeon made a diagnosis of a typical trifacial neuralgia (tic douloureux) and recommended a decompression-type operation. On further examination it was decided that both the diagnosis and the proposed operation would require further investigation and that multiple sclerosis was possible.

The patient was referred for a psychiatric survey and cerebrospinal fluid examination. The discovery of an elevated protein concentration in the cerebrospinal fluid led to consideration of an intracranial tumor.

An exploratory operation was performed on July 29, 1955. In the left cerebellopontine angle there was encountered a large epidermoid tumor extending from the seventh and eighth cranial nerves up through the tentorial notch and lying over and compressing the posterior root of the fifth nerve.

The tumor was completely removed. All of the symptoms of the past seven years disappeared, and only a slight paresthesia in the lower left gingiva and lower left lateral border of the tongue remains.

*5720 Wilshire Boulevard*

## A FORMULA FOR PREMEDICATION

*By Jerome S. Mittelman, D.D.S.,*
*New York.*

Successful treatment of dental patients undergoing extensive operations for crown and bridge prostheses depends on emotional as well as mechanical and physical factors. One cannot consider the teeth alone but must take into account the patient himself. This consideration is important not only from the patient's point of view but is necessary if the operator is to avoid the undue strain and tension which results from dealing with an apprehensive patient.

A kindly, professional bearing, a sympathetic approach and the use of local anesthetics are routinely accepted. Judicious premedication in selected patients also serves to promote efficiency. Proper use of premedication makes possible tolerance of longer appointments and creates a more positive, cooperative attitude. Acceptance of more complete treatment planning also is achieved as a result of kinder treatment.

A well balanced formula that dulls the edge of apprehension, raises the threshold of sensitivity to pain and creates an optimistic frame of mind and sense of well-being has been developed. The combination of ingredients is as follows: pentobarbital, 0.5 grains; dextro amphetamine sulfate, 5 mg.; acetylsalicylic acid, 2.5 grains, and phenacetin, 2.5 grains.

The effectiveness of this formula in overcoming preoccupation with required dental procedures results from multiple synergisms among its components. There is little need for the patient to take the capsule one-half hour before the scheduled appointment, as it is after being operated on for that span of time that the patient might best utilize fortification. The capsule is given, therefore, as the patient is seated.

The quantitative benefits derived from the premedication seem to vary in degree from one individual to the next depending on sensitivity. The dosage, nevertheless, is considered average and is well tolerated.

Drowsiness is avoided because of counteraction of the first two ingredients. The sedative action of pentobarbital balances the somewhat stimulating effect of dextro amphetamine sulfate which also serves to allay fear and promote a feeling of well-being. Patients with cardiac ailments should not receive the capsules without having the approval of their physician.

Thoughtful use of proper premedication should be considered as a kindness to the patient and as an instrument for doing better dentistry.

*30 East 60th Street*

COUNCIL ON LEGISLATION

# Association testimony before House subcommittee on health care plan for military dependents

On Wednesday, January 25, J. Claude Earnest, vice-chairman of the Council on Legislation, urged a subcommittee of the House of Representatives Armed Services Committee to adopt recommendations of the Association aimed at limiting strictly the use of military dental officers and facilities for care of dependents. In his statement Dr. Earnest also suggested that the Committee give serious consideration to the use of civilian dentists and facilities wherever such a plan could be arranged. The full text of the statement of the Council on Legislation follows.

I am J. Claude Earnest of Monroe, La. I am engaged in the private practice of dentistry in that community. I am also an active member of the Air Force Reserve, holding a commission as colonel in the Dental Service. I am here today in my capacity as vice-chairman of the Council on Legislation of the American Dental Association to present the Association's views on H.R. 7994, the proposed Armed Forces Dependents Medical Care Act of 1956. With me is Mr. Bernard J. Conway of Chicago, who is secretary of the Council on Legislation.

H.R. 7994 is designed to provide an improved and more uniformly available program of health care for the dependents of members of the Armed Forces. The bill also proposes a more equitable system of health care for the dependents of persons on active duty with the Coast Guard, Coast and Geodetic Service, and the Public Health Service.

The American Dental Association, in 1954, adopted a comprehensive statement of principles on military dependent dental health care. I shall discuss the important dental provisions within H.R. 7994 as they relate to those principles. Before presenting that evaluation and the Association's specific recommendations, however, I would like to emphasize the American Dental Association's attitude toward the general objectives of H.R. 7994.

Within limitations, the federal government, like any other employer, may be justified in considering the provisions of health care benefits to dependents of members of the Armed Forces as an indirect form of compensation for active military service. Whether the health care of dependents of members of the Armed Forces should be financed in whole or in part by the federal government as a desirable emolument of military service is, in the Association's viewpoint, a policy decision that should be left to the discretion of Congress. The American Dental Association, however, is concerned with the adverse effects that any plan for providing dependent dental health care at military dental facilities may have on the quantity and quality of dental health care available to members of the Armed Forces and, of equal importance, on the balance that must be maintained between the dental manpower allocated to the Armed Forces and that which remains to serve the civilian community. Finally, the Association has no objection to a federal plan for financing the dental health care of Armed Forces dependents in civilian facilities as long as that plan is in keeping with the Association's principles applicable to government-financed dental health care programs. I shall develop more fully all aspects of the Association's position on dependent dental health care in the specific treatment of H.R. 7994.

### ELIGIBILITY REQUIREMENTS

Section 105 of H.R. 7994 identifies those entitled to dependents' health care benefits. In essence, the health care benefits would be available to dependents of members of the Armed Forces, including the dependents of certain retired personnel and the widows and dependent children of persons who were members of the Armed Forces at time of death. In defining "dependents," H.R. 7994 includes those in a reasonably close family relation to the Armed Forces member and has adequate provision for excluding children over 21 years of age, parents, and parents-in-law who are not actually dependent on an Armed Forces member for support; the definition also excludes, on her remarriage, the widow and dependent children of a person who was a member of the Armed Forces at time of death. In defining "members of the Armed Forces," the legislation excludes those on active duty for training purposes and thereby makes their dependents ineligible for the health care benefits provided in the bill. The American Dental Association has no objection to the eligibility requirements established in H.R. 7994.

### DEPENDENTS' DENTAL CARE AT MILITARY FACILITIES

Section 109 of H.R. 7994 is the focal point of the Association's interest. That section spells out the limitations on dependents' dental health care at military facilities. With the exception of those dependents located in remote areas where adequate civilian dental facilities are not available, dependents located within the continental limits of the United States would be entitled to receive at military facilities only emergency dental health care and dental health care as a necessary adjunct to medical or surgical treatment. "Emergency dental care" is defined as the care required to relieve pain and suffering and would not include any permanent restorative work or dental prosthesis. Complete dental health care is inferentially authorized within Section 109 for those dependents who are located outside the continental limits of the United States or who are located in remote areas within the continental limits where adequate civilian dental facilities are not available. There is no provision in Section 109, or in any other section of H.R. 7994, for defraying the cost of dental health care obtained by dependents in civilian facilities.

The limitations on the use of military facilities and Armed Forces dental officers for providing dental health care to dependents, as stated in H.R. 7994, are generally in accord with the policy of the American Dental Association. Dependents who are stationed overseas ordinarily must rely on the Armed Forces' physicians and dentists for their health care needs. The Association generally concurs with the intent of H.R. 7994 to continue providing overseas dependents their necessary dental health care at military facilities. In order, however, to keep the dependent patient load from interfering with the Armed Forces' primary mission of caring for military personnel, the Association recommends first, that Section 104(h) be amended so that overseas area commanders will be permitted to contract with local dental sources for the dental health care of dependents in the same manner proposed for the medical care of dependents, and second, that the Armed Services Committee, in its report on H.R. 7994, request the Department of Defense to provide by regulation that dependents scheduled to go overseas be required to have their dental defects treated before they depart for an overseas installation. That requirement would be in the best interests of both the Armed Forces and the dependents. The dental health care of overseas dependents, according to Section 109, will "depend upon the availability of space, facilities, and the capabilities of the dental staff." If dependents scheduled to go overseas are required to bring their dental health to a state of maintenance before departing, the overseas dental program for Armed Forces personnel could be much more effectively administered, and the dependents would have a better opportunity to have any necessary dental work attended to promptly.

The implementation of the restrictions on the use of domestic military facilities for providing dental health care to dependents will depend to a great extent on the interpretation of such phrases as "remote areas" and "dental care as a necessary adjunct to medical or surgical treatment." The effect of those restrictions will also depend on the efforts of the Armed Forces to carry out the general intent of Section 109 of H.R. 7994, which is to have military dental officers concentrate their attention on the care of members of the Armed Forces.

Today, there are approximately 5,800 dentists in the Armed Forces serving a military population of nearly three million—one dentist for every 500 troops. There are about 78,000 active civilian dentists in a civilian population of some 163 million—one dentist for every 2,100 civilians. On a percentage basis, 7 per cent of the nation's active dentists is serving 1.8 per cent of the nation's population, the members of the Armed Forces. As long as the Armed Forces are required to accept for active military service persons with

seriously neglected dental conditions, the burden of the military patient load will, in the Association's opinion, tax to capacity the efforts of military dental officers. The existing dental officer staffing pattern, furthermore, is based on the dental health requirements of Armed Forces members.

The Armed Services Committee is well aware of the exceptional burden that has been placed on members of the dental profession over the past five years to maintain the personnel strengths of the three Armed Forces dental services. The continuation of the doctor draft law, as it applies to dentists, was justified by the Department of Defense on the basis of the dental health needs of the Armed Forces members. The Association believes, therefore, that Section 109 of H.R. 7994 should be administered in such a way that the emphasis will be on a minimum use of military dental officers for the care of dependents. To that end the Association recommends that the phrase "remote areas within the continental limits of the United States where adequate civilian dental facilities are not available" be strictly defined and identified in Department of Defense regulations. The Association also recommends that the phrase "dental care as a necessary adjunct to medical or surgical treatment" be changed to "dental care as a necessary adjunct to inpatient medical or surgical treatment." Without that qualification, dental health care adjunctive to medical or surgical treatment could readily be extended to include most types of dental health care within the military facilities' dependent program. The adjunctive dental health care proposed within Section 109 should be strictly limited to hospitalized patients in accordance with the customary procedure for joining the efforts of medicine and dentistry in the best interests of the patient. The American Dental Association, furthermore, opposes any attempt to place the physician in the position of prescribing what dental services a patient may need.

### DEPENDENTS' DENTAL CARE FROM CIVILIAN SOURCES

At the beginning of this statement, I pointed out that the American Dental Association would not object to a plan for defraying the cost of dependents' dental health care obtained at civilian facilities. H.R. 7994, while providing a plan for obtaining dependent medical care from civilian sources, eliminates from consideration a similar method for providing dependent dental health care.

Although there is not enough evidence, today, that the insurance principle can be applied generally to the cost of dental health care, there is increasing evidence that many types of dental service might be economically prepaid. The Association has under its surveillance a number of experimental prepayment dental plans. Our attention has been especially directed to the management-labor sponsored experimental programs for the children of members of the International Longshoremen's and Warehousemen's Union now in operation on the West Coast. The Association has continually stressed that its state societies explore the possibility of establishing pilot dental prepayment plans. The Association has also emphasized that those programs should give priority to the dental health care of children. Should there develop a professionally and economically sound method for prepaying dental health care, particularly the care of children, that plan could not be made available to dependent children of Armed Forces members under H.R. 7994. In addition H.R. 7994 would exclude from any basic insurance plan, those dental services performed in hospitals by dental members of the hospital staff. The American Dental Association urges the Armed Services Committee to make an appropriate addition to H.R. 7994 and suggests the following new section to be designated "Section 110":

"The Secretary of Defense shall be authorized to make available to members of the Armed Forces a plan or plans, recommended and approved by the Assistant Secretary of Defense (Health and Medical), whereby the Department of Defense shall defray a percentage of the cost of the dental health care of dependents obtained from civilian sources. For each member of the Armed Forces who elects to have his dependents participate in such a plan, the Department of Defense shall defray not to exceed 70 per cent of the amount required for enrolling his dependents under the plan. Payment by a member of the Armed Forces of his share of the cost of enrolling his dependents in any plan authorized under this section shall be by allotment of pay as the Secretary of Defense shall prescribe. Participation in any plan authorized under this section shall be pursuant to regulations prescribed by the Secretary of Defense and approved by the President."

The language in the amendment recommended by the Association would strengthen H.R. 7994 in two ways. First, it would permit the Secretary of Defense to include within a basic insurance plan the dental services which are normally available to those who participate in health service plans such as Blue Cross and Blue Shield; many of those plans now defray the cost of oral surgical services performed

by dentists in hospitals. Second, the Association's proposed addition to H.R. 7994 would permit the Secretary of Defense to extend to dependents, at some future date, an opportunity to have a portion of the cost of their dental health care obtained from civilian sources borne by the Federal Government.

Should the Committee decide to amend H.R. 7994 by adding Section 110 as recommended by the Association, we request that the Armed Services Committee include in its report a recommendation to the Department of Defense, first, that the Assistant Secretary of Defense (Health and Medical), through his Dental Advisory Committee, conduct a continuing survey of methods for furnishing dental health care to dependents from civilian sources; and second, that the Assistant Secretary of Defense (Health and Medical), in submitting any recommendations to the Secretary of Defense for initiating a program of comprehensive dental health care for dependents from civilian sources, give first priority to a pilot dental health care program for eligible children in keeping with the American Dental Association's principles applicable to dental health care programs.

### DEPENDENTS OF MEMBERS OF OTHER FEDERAL SERVICES

H.R. 7994 would also make some changes in the health care program for dependents of members of the Coast Guard, Coast and Geodetic Service, and the Public Health Service. The American Dental Association has no specific policy on dependent care for those groups. The principles which the Association has established for the dental health care of Armed Forces dependents, for the most part, can be applied to the other groups in H.R. 7994. The basic missions of Armed Forces and Public Health Service dental units require the full efforts of the dental officers assigned to those units. The American Dental Association opposes any plan for extending dependent dental health care that would interfere with the primary obligations of federal dental officers.

In behalf of the American Dental Association I urge this Committee to adopt the recommendations presented in this statement. They are summarized at the end of this statement. The Association also wishes to express its appreciation for the opportunity of presenting its position on this important legislation.

### RECOMMENDATIONS ON H.R. 7994

1. That Section 104(h) be amended so that overseas area commanders will be permitted to contract with local dental sources for dependents' dental health care in the same manner and under the same conditions as proposed for dependents' medical care.

2. That the Armed Services Committee, in its report on H.R. 7994, request the Secretary of Defense to provide by regulation that dependents scheduled to go overseas be required to have their dental conditions treated before they depart for an overseas installation.

3. That "remote areas within the continental limits of the United States where adequate civilian dental facilities are not available" within Section 109 be strictly defined and identified in Department of Defense regulations.

4. That the word "inpatient" be inserted before the word "medical" in line 10 of Section 109 so that the pertinent phrase will read: "dental care as a necessary adjunct to inpatient medical or surgical treatment."

5. That H.R. 7994 be amended by adding a new section after Section 109 to be designated "Section 110," that section to read as follows:

"The Secretary of Defense shall be authorized to make available to members of the Armed Forces a plan or plans, recommended and approved by the Assistant Secretary of Defense (Health and Medical), whereby the Department of Defense shall defray a percentage of the cost of the dental health care of dependents obtained from civilian sources. For each member of the Armed Forces who elects to have his dependents participate in such a plan, the Department of Defense shall defray not to exceed 70 per cent of the amount required for enrolling his dependents under the plan. Payment by a member of the Armed Forces of his share of the cost of enrolling his dependents in any plan authorized under this section shall be by allotment of pay as the Secretary of Defense shall prescribe. Participation in any plan authorized under this section shall be pursuant to regulations prescribed by the Secretary of Defense and approved by the President."

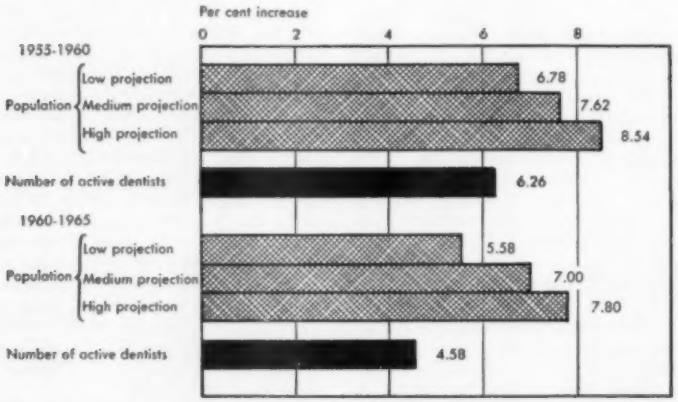
COUNCIL ON DENTAL RESEARCH

# The need for dental research support

Today dentistry is confronted with a situation warranting thoughtful attention. The number of practicing dentists continues to fall behind the rate of population growth. Dental schools are attempting to augment dental manpower by carrying maximum student loads. Nevertheless, this continually expanding population—according to the Hoover Commission about two and a half million persons per year—is producing a statistical picture of increasing concern (Fig. 1).

The total annual expenditure for health care in this country has been estimated at approximately $10,000,000,000. The estimates for dental care vary from a billion dollars to a billion and six-tenths per year. The Bureau of Economic Research and Statistics of the American Dental Association estimates that the gross income of all dentists in private practice in 1952 was $1,300,000,000, an estimate based on a mail survey of dentists conducted in 1953. In short, about 13 per cent of every dollar spent for health care is spent for dental care. In spite of this large expenditure, a majority of the United States population is not receiving adequate dental care. A recent study shows that only 42 per cent of the population see a dentist in the course of a year.

As one indication of present dental needs, consider the dental needs as disclosed by a recent survey of 10,000 inductees conducted by the Army Dental Service. This study showed that the average inductee required five fillings, while 6 per cent needed upper dentures,




Sources: Population projections are from "Revised Projections of the Population of the United States, by Age and Sex: 1960 to 1975." Current Population Reports, Series P-25, No. 123, Bureau of the Census, Oct. 20, 1955. Projections of the number of dentists are from unpublished data of the Bureau of Economic Research and Statistics, American Dental Association.

*Fig. 1 • Predicted percentage increase in population and in number of dentists*

11 per cent lower dentures, 40 per cent bridgework, and 45 per cent some type of dental or oral prophylaxis.[1]

In seeking reasons for and means to correct these conditions, many proposals have been considered. An increase in the amount of dental research to a point commensurate with the magnitude of the problem would seem the most logical approach, with the hope that future dental needs might be considerably reduced.

**Table 1** • Number of dental research grants and other research grants, by states

| State | No. of dental research projects | No. of all other research projects |
|---|---|---|
| Alabama | 4 | 86 |
| Arizona | 0 | 71 |
| Arkansas | 0 | 93 |
| California | 5 | 453 |
| Colorado | 0 | 105 |
| Connecticut | 1 | 152 |
| Delaware | 0 | 37 |
| D. C. | 5 | 104 |
| Florida | 0 | 103 |
| Georgia | 2 | 135 |
| Idaho | 0 | 68 |
| Illinois | 17 | 411 |
| Indiana | 6 | 142 |
| Iowa | 1 | 134 |
| Kansas | 0 | 132 |
| Kentucky | 0 | 86 |
| Louisiana | 0 | 142 |
| Maine | 0 | 87 |
| Maryland | 1 | 229 |
| Massachusetts | 19 | 584 |
| Michigan | 3 | 210 |
| Minnesota | 6 | 209 |
| Mississippi | 0 | 99 |
| Missouri | 3 | 207 |
| Montana | 0 | 74 |
| Nebraska | 0 | 113 |
| Nevada | 0 | 25 |
| New Hampshire | 0 | 56 |
| New Jersey | 1 | 107 |
| New Mexico | 0 | 39 |
| New York | 17 | 780 |
| North Carolina | 0 | 222 |
| North Dakota | 0 | 70 |
| Ohio | 4 | 295 |
| Oklahoma | 0 | 89 |
| Oregon | 1 | 97 |
| Pennsylvania | 7 | 457 |
| Rhode Island | 0 | 64 |
| South Carolina | 0 | 67 |
| South Dakota | 0 | 54 |
| Tennessee | 0 | 169 |
| Texas | 0 | 222 |
| Utah | 0 | 92 |
| Vermont | 0 | 42 |
| Virginia | 2 | 113 |
| Washington | 0 | 167 |
| West Virginia | 0 | 78 |
| Wisconsin | 4 | 147 |
| Wyoming | 0 | 42 |

From: Federal Grants and Contracts for Unclassified Research in the Life Sciences—Fiscal Year 1954. National Science Foundation, Washington, D. C., 1955.

## U. S. GOVERNMENT SUPPORT OF RESEARCH

To illustrate the amount of dental research in relation to most government supported research in the health and life sciences, certain fundamental material has been assembled.

Recently the National Science Foundation reported on the number of federal grants and contracts for unclassified research in the life sciences for fiscal year 1954. The compilation reported the program of ten research-supporting agencies in the federal government and listed

1. Rusk, Howard. The "doctor draft" act. New York Times, July 3, 1955.

**Table 2** • Breakdown of supporting agencies in respect to dental research projects

| Agency | No. of dental research projects | No. of all other research projects |
|---|---|---|
| Department of Agriculture | 2 | 3,138 |
| Atomic Energy Commission | 0 | 375 |
| Department of the Army | 29 | 533 |
| Department of the Navy | 19 | 409 |
| Department of the Air Force | 13 | 129 |
| Department of Health, Education, & Welfare | 47 | 3,047 |
| Department of the Interior | 0 | 10 |
| National Science Foundation | 0 | 292 |
| Veterans Administration | 0 | 21 |
| Tennessee Valley Authority | 3 | 17 |

**Table 3** • History of research grants appropriations, National Institutes of Health

| F.Y. Year | A Arth. | B Neuro. | C Cancer | D Dental | E Micro. | G General | H Heart | M M. Hlth. | Total | % Inc. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1945 | | | 85,030 | | | | | | 85,030 | |
| 1946 | | | 76,900 | | | 703,258 | | | 780,158 | 818 |
| 1947 | | | 515,000 | | | 2,922,280 | | | 3,437,280 | 341 |
| 1948 | | | 2,599,635 | | | 5,901,163 | | 373,665 | 8,874,463 | 158 |
| 1949 | | | 3,300,000 | (153,113)* | | 7,025,492 | (1,464,734)* | 546,000 | 10,871,492 | 23 |
| 1950 | | | 2,600,000 | 200,000 | | 5,570,000 | 3,901,514 | 794,000 | 13,065,514 | 20 |
| 1951 | | | 3,176,000 | 221,000 | | 7,501,000 | 4,709,000 | 1,146,000 | 16,713,000 | 28 |
| 1952 | (1,345,000)* | (1,015,000)* | 3,100,000 | 221,000 | (1,950,000)* | 8,615,000 | 4,824,000 | 1,413,000 | 18,173,000 | 9 |
| 1953 | (1,345,000)* | (965,000)* | 4,920,000 | 221,000 | (1,950,000)* | 8,515,000 | 5,133,000 | 1,585,000 | 20,374,000 | 12 |
| 1954 | 3,196,000 | 2,700,000 | 7,369,000 | 221,000 | 1,950,000 | 4,000,000 | 6,843,000 | 2,587,000 | 28,866,000 | 42 |
| 1955 | 3,990,000 | 3,900,000 | 8,160,000 | 421,000 | 2,110,000 | 4,000,000 | 7,750,000 | 3,587,000 | 33,918,000 | 18 |
| 1956 | 4,810,000 | 4,350,000 | 9,110,000 | 421,000 | 2,110,000 | 5,000,000† | 8,550,000 | 3,687,000 | 38,038,000 | 12 |

*Included in DRG (G-General) funds.
†Includes $500,000 nursing research.

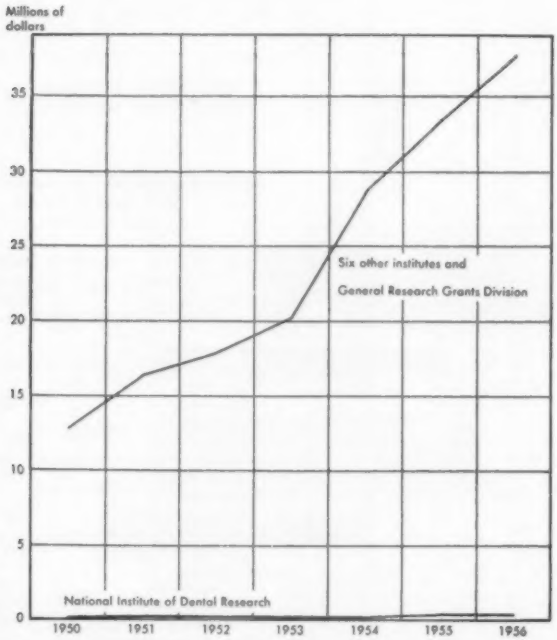



*Fig. 2 • Research grants appropriations, National Institutes of Health, fiscal years 1950 through 1956*

8,144 projects supported at a total annual cost of $64,730,900. It was believed that the projects listed constitute approximately 95 per cent of the unclassified extramural research programs of the United States government in the life sciences. In Table 1 are shown the number of dental research grants and the number of other research grants included in this compilation by states. The dental research grants constituted but 1.4 per cent of the total number of grants or contracts.

A breakdown of the ten supporting agencies in respect to dental research projects and other research projects, as reported by the National Science Foundation, is shown in Table 2. Of the ten supporting agencies listed, about 95 per cent of all dental research grants are made by one or the other of four agencies—the Office of the Surgeon General of the Army, the Department of the Navy, the Department of the Air Force, and the Department of Health, Education, and Welfare. These four agencies made slightly more than 100 dental research grants during the fiscal year covered by the report. Of the four agencies cited as particularly concerned with dental research grants, the Department of Health, Education, and Welfare made the largest number. Percentage-wise, in relation to other research grants, they were the lowest, 1.5 per cent of all grants in contrast to the three armed services where 5.7 per cent of the grants were for dental research.

**Table 4** • Geographical distribution of dental research grants awarded by National Institute of Dental Research in fiscal year 1954 to United States institutions conducting both dental and medical research

| Area | States | No. of dental research projects | No. of medical research projects |
|---|---|---|---|
| New England | Maine, Vt., N.H., Mass., R.I., Conn. | 3 | 115 |
| Middle Atlantic | N.Y., Pa., N.J. | 7 | 285 |
| South Atlantic | Del., Md., D.C., Fla., Va., W.Va., N.C., S.C., Ga. | 4 | 73 |
| East North Central | Ohio, Ind., Ill., Mich., Wis. | 9 | 223 |
| East South Central | Ky., Tenn., Miss., Ala. | 0 | 38 |
| West North Central | Minn., Iowa, Mo., N.D., S.D., Neb., Kan. | 2 | 144 |
| West South Central | Ark., La., Okla., Texas | 0 | 47 |
| Mountain | Mont., Idaho, Wyo., Nev., Utah, Colo., Ariz., N. Mex. | No dental research projects | * |
| Pacific | Wash., Oreg., Calif. | 2 | 207 |
| Total | | 27 | 1,132 |

*A number of medical research projects are being conducted in this area.

*Fig. 3 • Approved dental research projects that have not been paid because of insufficient funds (forty applications, December 1955)*

### NATIONAL INSTITUTES OF HEALTH

Inasmuch as more dental research grants were made by the National Institutes of Health, the operations of that agency will be analyzed more in detail. The history of the research grant appropriations for the National Institutes of Health is shown in Table 3 and Figure 2. The geographical distribution of dental research grants awarded by the National Institute of Dental Research in fiscal year 1954 to United States institutions conducting both dental and medical research is shown in Table 4. The dental research grants constituted 2.4 per cent of the total research grants.

A small but interesting example of the critical shortage of funds available for dental research may be seen in Figure 3, which spots the location of 40 investigators who have applied to the National Institutes of Health for support for dental research. All of these applications have been recommended for payment by the National Advisory Dental Research Council, yet they cannot be paid because of the lack of necessary funds.

### SUMMARY AND CONCLUSION

This situation permits a brief but pointed conclusion. First, it is quite unlikely that the dental manpower in the foreseeable future will be able to keep pace with the growing population. It naturally follows, therefore, that every effort should be made to reduce very appreciably the amount of dental need through an intensive and enlarged research effort.

The dental research potential today is far in excess of appropriated funds to support dental research. The staffs of the 43 dental schools and the numerous other research centers where dental research is being conducted or can be conducted await only the stimulus of research grants to expand their program greatly. One is justified in assuming that the rewards from an increase in dental research funds will be as great to the improvement of oral health as has been the reward from research in other health fields.

The time is ripe for a broad research inquiry into the many-sided aspects of dental diseases and oral health.

COUNCIL ON DENTAL EDUCATION

# Dental and dental hygiene students: their characteristics, finances and practice plans
## IV. School expenses of dental students

The average student spent an estimated $4,465 to cover items of school cost during four years at school. Charges by schools for tuition and fees represent a major fraction of this cost. Of the total spent to meet school expenses, $2,522 or 57 per cent was used to meet such charges. The amounts spent for rental or purchase of supplies and equipment also built up to an impressive total. For the average student, $1,392, or 31 per cent of his school expenses, were for this purpose. Equipment rental charges actually were not reported in any substantial amount; the average was only $95, as contrasted with purchases which totaled $1,297. The cost of textbooks amounted to $301, or less than 7 per cent of all school expenses, while the amount reported as "other" to meet otherwise undesignated items of expense such as fraternity dues, state board examination fees, and so on, was $250.

Although the basic items of school expense have about doubled during the past two decades, this increase has merely reflected changes in the purchasing power of the dollar. Estimated four-year costs, based on the 1931-32 reports collected by Leuck, differ only slightly from those found in this study, when the earlier estimates are expressed in 1953 dollars. Data from the two studies provide comparable estimates for "tuition and fees," "supplies and equipment," and for "books." The sum of these three school-cost items as estimated from the present study ($4,215), matches closely that projected from the 1931-32 data ($4,194). The estimate of $1,450 for supplies and equipment, including rentals and purchases, was $58 greater in the early study than in the present one, while the amounts for tuition and fees and for books, respectively, were $12 and $77 less.

### DIFFERENCES IN SCHOOL EXPENSES

*Differences Associated with Year in School* • As was noted in the previous chapter, school expenses reached a maximum level during the sophomore year and declined sharply thereafter. Data in Figure 16 present a class by class review of average expenditures for different items of school expense. In addition to the data from the current study, values have been plotted to show the patterns for 1931-32 as expressed in 1953 dollars.

The schedules returned for the 1953-54 school year indicate that year by year changes in the amounts spent for rental and purchase of supplies and equipment largely account for the differences noted in total school expenses. The amount spent for these items increased from $380 per student in the freshman year to $530 for sophomore students. Such expenditures declined to $330 in the junior year, and in the senior year they were further reduced to only $140 per student. Tuition

This is Chapter 4 of a report of a cooperative study made by the Council on Dental Education of the American Dental Association and the Division of Dental Resources of the United States Public Health Service.

Text of this report was prepared by Walter J. Pelton, D.D.S., M.S.P.H.; Quentin M. Smith, D.D.S.; Elliott H. Pennell; Ruth D. Bothwell, and James N. Ake, Washington, D. C.

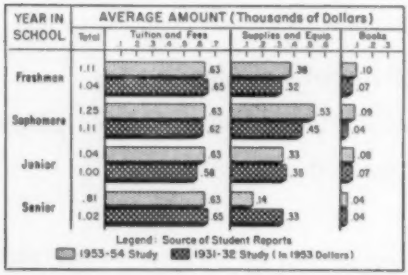



*Fig. 16 • Average amounts spent to meet selected items of school costs in the reporting year: 1953-54 and 1931-32*

and fees averaged $630 for each year in school, and the cost of books gradually declined from a high of about $100 in the freshman year to $40 in the senior year.

The 1931-32 pattern of student expenditures by year in school closely paralleled that reported in the current study. Amounts reported for the different items of school expense, when expressed in 1953 dollar values, are very close to current estimates. Amounts for tuition and fees varied from class to class, but the extent of divergence from those currently being assessed is not great. Expenditures for books were lower in all but the senior year, but again they represented only a small fragment of the total school expenses. Only in the pattern of payment for supplies and equipment was there any large departure from the averages which characterized the 1953-54 reports. In the early study period, there was apparently a much greater tendency for students to postpone purchases to the senior year. As a result, the cost of these items was more evenly distributed throughout the period of school attendance. In fact, amounts spent in the freshman, junior and senior years were approximately the same. In the sophomore year, the average per student was about one third greater than in any other year.

While "other" school costs were not reported in 1931-32, reports from the current study indicate that their magnitude was not large. In 1953-54, "other" expenses increased from only $51 in the freshman year to $67 for sophomores. The corresponding averages for juniors and seniors were $63 and $69, respectively.

*School Differences* • Not only do total school costs differ widely among schools, but the distribution of these costs from class to class and between the several items making up the total show wide differences at all levels. In reviewing reported school costs, it is important to note that such expenditures develop within a framework of charges which are largely determined for students in each class by school policy. The amounts for a majority of reporting schools increased to a maximum in the sophomore year and declined thereafter. In other schools, a similar pattern prevailed, except that the maximum cost was in the freshman or in the junior year. Not infrequently, school costs in the senior year were no more than one half those reported in the year when the maximum was reached. For a few schools, the amounts changed but little from class to class. Patterns of expenditures were complicated in state schools because of the higher tuition and fees which are charged to nonresident as compared with resident students. Within individual schools, it was also evident from the reports received that many students in a given class were able to reduce their expenditures substantially below those reported by others in the same class, perhaps through more extensive use of rental equipment, minimal and more economical purchases of supplies and equipment, and postponement of major purchases to later years.

*Student Reports of School Costs vs. School Estimates* • Estimates of school

**Table 21** • School expenses reported per student for individual schools and average amounts for schools with different reported expense levels, for the school year 1953-54

| Average reported total school expense for individual schools | Items of school expense | | | |
|---|---|---|---|---|
| | Tuition and fees | Supplies and equipment | Books | Other |
| Average—35 schools | | | | |
| $1,087 | $618 | $336 | $74 | $59 |
| $1,350 and over (3 schools) | | | | |
| 1,475 | 888 | 468 | 78 | 41 |
| 1,400 | 896 | 348 | 66 | 90 |
| 1,397 | 760 | 486 | 63 | 88 |
| Mean—1,424 | 848 | 434 | 69 | 73 |
| $1,200 to $1,349 (9 schools) | | | | |
| 1,317 | 702 | 360 | 162 | 93 |
| 1,266 | 720 | 414 | 65 | 67 |
| 1,261 | 879 | 284 | 54 | 44 |
| 1,259 | 554 | 567 | 65 | 73 |
| 1,253 | 656 | 453 | 96 | 48 |
| 1,225 | 662 | 405 | 77 | 81 |
| 1,216 | 709 | 371 | 74 | 62 |
| 1,212 | 739 | 350 | 71 | 52 |
| 1,209 | 721 | 332 | 95 | 61 |
| Mean—1,247 | 705 | 393 | 84 | 65 |
| $1,050 to $1,199 (9 schools) | | | | |
| 1,196 | 620 | 397 | 89 | 90 |
| 1,183 | 682 | 368 | 70 | 63 |
| 1,180 | 692 | 392 | 60 | 36 |
| 1,148 | 630 | 390 | 81 | 47 |
| 1,147 | 644 | 369 | 84 | 50 |
| 1,139 | 652 | 365 | 66 | 56 |
| 1,110 | 611 | 360 | 83 | 56 |
| 1,095 | 634 | 344 | 59 | 58 |
| 1,079 | 610 | 339 | 81 | 49 |
| Mean—1,142 | 642 | 369 | 75 | 56 |
| $900 to $1,049 (6 schools) | | | | |
| 1,044 | 847 | 110 | 60 | 27 |
| 1,018 | 558 | 337 | 65 | 58 |
| 972 | 438 | 391 | 76 | 67 |
| 943 | 518 | 301 | 73 | 51 |
| 925 | 430 | 371 | 76 | 48 |
| 907 | 671 | 121 | 62 | 53 |
| Mean—968 | 577 | 272 | 68 | 51 |
| Less than 900 (8 schools) | | | | |
| 892 | 570 | 197 | 88 | 37 |
| 882 | 309 | 435 | 74 | 64 |
| 874 | 469 | 259 | 96 | 50 |
| 837 | 428 | 278 | 58 | 73 |
| 828 | 739 | 18 | 9 | 62 |
| 781 | 370 | 292 | 93 | 26 |
| 713 | 269 | 309 | 69 | 66 |
| 666 | 351 | 177 | 65 | 73 |
| Mean—809 | 438 | 246 | 69 | 56 |

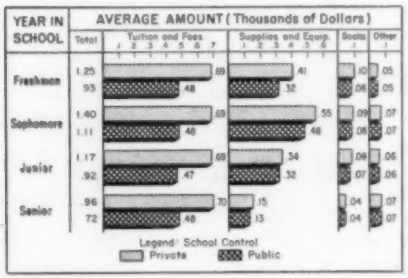



*Fig. 17 • Average amounts spent to meet school costs by type of school attended, for the school year 1953-54*

expenses prepared by schools to guide students in budgeting the cost of their education are in very close agreement with those obtained from student reports in the current study. For nonstate schools, in fact, estimates from the two sources of the basic items of school expense are identical. The average derived from data prepared by the schools and published by the Council on Dental Education of the American Dental Association in their October 1953 survey of the cost of dental education, was $4,470, or the same as that obtained from this study. Even the distribution among the three basic items was essentially the same.

Because of the inclusion of both resident and nonresident students in the reporting group, the cost estimates reported by students for state schools were intermediate between those supplied by the schools for these two groups of students. To assure greater comparability, the figures supplied by the schools were adjusted by weighting resident and nonresident costs by numbers of students reported as in these two categories in the 1953 Dental Students Register. The average of these four-year estimates for all state schools was $3,260 as compared with $3,430 obtained from student reports. The slightly lower figure obtained from the school estimates is accounted for largely by the amount for tuition and fees which was $110 less. For the majority of schools, estimates from the two sources were in close agreement. In a few instances, however, particularly in respect to payments for supplies and equipment, the amounts stipulated by students were substantially greater or less than the amounts given by the schools.

*Differences Between High-and-Low-Cost Schools* • Data to show the relation between total school expense in the study year and amounts expended for those groupings of basic expense items which make up the total are presented in Table 21. The figures represent simple averages obtained from amounts per student, determined for individual schools on the basis of the reports their students submitted. The grouping of schools is designed to portray the extent to which various school expense items enter into a determination of total expense at different levels of school cost. From the averages presented, it is clearly evident that tuition and fees as well as supplies and equipment are extremely important factors in the determining of total school costs. As the average total expense increased from $809 to $1,424 between the low and the high cost schools, expenditures to meet the cost of tuition and fees increased by more than $400, while the cost of supplies and equipment expanded by nearly $190. The cost of books showed no consistent pattern of change, and "other" expense items added only $17 on the average to the total school expenditures.

While the amounts expended for tuition and fees and for supplies and equipment increased by large amounts as total expenditures increased, their proportionate representation fluctuated only slightly from one succeeding group of schools to another. The cost of books and "other" items of expense, on the other hand, because of their failure to change materially in amount as total costs increased, actually represented slightly smaller fractions

**Table 22** • Average school expenses of dental students, by type of school, for the school year 1953-54

| Year in school and type of school | Items of school expense | | | | |
|---|---|---|---|---|---|
| | Total | Tuition and fees | Supplies and equipment | Books | Other |
| Freshman | $1,160 | $630 | $383 | $ 96 | $51 |
| Private | 1,250 | 690 | 408 | 100 | 52 |
| Public | 927 | 477 | 317 | 84 | 49 |
| Sophomore | 1,320 | 632 | 533 | 88 | 67 |
| Private | 1,401 | 692 | 553 | 90 | 66 |
| Public | 1,111 | 478 | 482 | 82 | 69 |
| Junior | 1,103 | 630 | 332 | 78 | 63 |
| Private | 1,173 | 694 | 335 | 80 | 64 |
| Public | 922 | 465 | 325 | 74 | 58 |
| Senior | 882 | 630 | 144 | 39 | 69 |
| Private | 956 | 699 | 149 | 39 | 69 |
| Public | 721 | 477 | 136 | 39 | 69 |

of the total school cost in schools which were high in the array.

*Differences Between Private and Public Schools* • Data presented in Figure 17 and Table 22 provide a comparison of the magnitude of school expense items as reported by students in private and public schools for each class. For each year in school, expenditures by students in private schools for tuition and fees were about 45 per cent greater than were those by students in public schools. This annual difference, amounting to about $220, added nearly $900 to the total four-year cost of attending school. Expenditures for supplies and equipment were also greater, particularly in the first two years. For freshmen, the difference was about $90 and for sophomores, about $70, while in the junior and senior years, the differences were between $10 and $20 each year. The cost of books was slightly greater in private than in public schools during the first three years in school. There was no evidence of any material difference in the amounts spent for "other" expense items.

*Student Category* • Data showing four-year cost estimates for single students living at home, single students living away from home and married students in public and private schools are presented in Figure 18 and Table 23. The failure of marital status and living arrangements to have any appreciable influence on school costs is evident from these data.

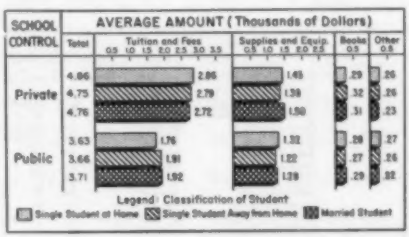



*Fig. 18 • Average four-year amounts spent to meet school costs by category of students and type of school attended: 1953-54*

**Table 23** • Average four-year school expenses reported by selected categories of students, by type of school: 1953-54

| Category of student and type of school | Items of school expense | | | | |
|---|---|---|---|---|---|
| | Total | Tuition and fees | Supplies and equipment | Books | Other |
| All students | $4,465 | $2,522 | $1,392 | $301 | $250 |
| Single—at home | 4,697 | 2,712 | 1,432 | 289 | 264 |
| Single—away from home | 4,428 | 2,527 | 1,335 | 305 | 261 |
| Married | 4,410 | 2,452 | 1,425 | 301 | 232 |
| Private | 4,780 | 2,775 | 1,445 | 309 | 251 |
| Single—at home | 4,862 | 2,860 | 1,450 | 289 | 263 |
| Single—away from home | 4,754 | 2,790 | 1,385 | 318 | 261 |
| Married | 4,761 | 2,721 | 1,498 | 308 | 234 |
| Public | 3,681 | 1,897 | 1,260 | 279 | 245 |
| Single—at home | 3,633 | 1,756 | 1,323 | 280 | 274 |
| Single—away from home | 3,660 | 1,914 | 1,217 | 271 | 258 |
| Married | 3,712 | 1,917 | 1,278 | 288 | 229 |

The four-year school costs for single students living at home was $1,230 greater in private than in public schools while single students living away from home spent $1,090 more. For married students, the corresponding difference was $1,050. These differences were largely attributable to greater expenditures for tuition and fees. For each group, however, expenditures for supplies and equipment were about $200 greater for students in private than for those in public schools. Amounts spent for books or for "other" items of expense did not vary in any consistent fashion.

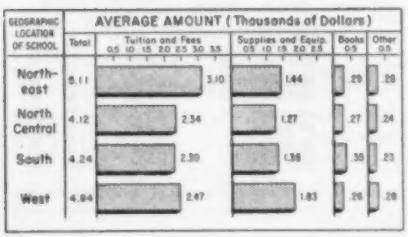



*Fig. 19 • Average four-year amounts spent to meet school costs, by region: 1953-54*

*Differences Associated with Veterans' Status* • Data reported for total school expense indicate that there was virtually no difference between veterans and nonveterans in the amount spent for any items of school expense. The amounts spent for tuition and fees, and for books were practically identical. Veterans spent about $40 more than nonveterans for supplies and equipment and about $20 less for other items in the course of four years at school.

*Regional Differences* • The pattern of total school costs reported by students differed considerably from one region of the country to another (Fig. 19 and Table 24). As was noted earlier, the highest average total for four years in school, $5,110, was reported from the Northeast while the corresponding value obtained from students in the Western states was only $270 less. On the other hand, school costs in the Southern and North Central regions were $870 and $990 less, respec-

**Table 24 • Average four-year school expenses reported by dental students, by region: 1953-54**

| Geographic location of school | Items of school expense | | | | |
|---|---|---|---|---|---|
| | Total | Tuition and fees | Supplies and equipment | Books | Other |
| Northeast | $5,113 | $3,101 | $1,441 | $293 | $278 |
| North Central | 4,122 | 2,343 | 1,270 | 272 | 237 |
| South | 4,241 | 2,300 | 1,357 | 351 | 233 |
| West | 4,842 | 2,464 | 1,833 | 262 | 283 |

tively. The high school costs in the Northeast result from relatively greater costs for tuition and fees. The four-year figure of $3,100 for these charges in the Northeast is $640 greater than the corresponding cost in the West and is $760 and $800 greater, respectively, than in the North Central and Southern regions. On the other hand, the expenditure of $1,830 for supplies and equipment by students in the West exceeds by $390 to $560 the corresponding amounts reported from any other region. Amounts spent for books were highest in the South and lowest in the West, while miscellaneous "other" expenditures were highest in the West and Northeast and lowest in the South. In neither of these categories, however, were four-year costs large; and the differences between regions were not sufficiently great to alter materially the pattern of total school costs.

## CONCLUSION

The increases which have taken place in tuition and fees since the early 1930's have apparently done no more than compensate dental schools for the decline in the purchasing power of the dollar. For the comparison presented in this chapter, however, data for the 1931-32 school year are restricted to 14 schools from which student reports were available in the earlier study and may not reflect accurately the situation in all schools during that school year.

Although no information is available from this study as to what the student receives for his current tuition dollar, it seems evident that its value has increased appreciably. The 22 years which elapsed between this and the earlier study have seen dental schools become integral parts of universities; clinical courses have been oriented to the basic sciences and to a full appreciation of the interrelationship of dental disease and systemic disorders; many new courses such as nutrition, pedodontics and dental public health have been added to the curriculum; and facilities available to students have been improved. This expensive evolution, it seems, has been accomplished with no increase in the financial burden to students.

COUNCIL ON DENTAL THERAPEUTICS

# Erythromycin and carbomycin—agents for use where penicillin is contraindicated

The organisms most frequently associated with oral infections include gram-positive bacteria, usually streptococci or micrococci. This has led to the general recommendation of penicillin as the drug of choice in the adjunctive treatment of oral infections and for prophylaxis before such dental operations as extractions and periodontal procedures.

Penicillin is bactericidal rather than bacteriostatic in action. It is remarkably effective against the oral bacteria, and may be given to most individuals in large doses with impunity as a result of its low toxicity. Moreover, penicillin has been used extensively over a great many years in various fields of dental practice, and its position as the antibiotic of preference is based on impressive results in clinical use. Its value in streptococcal and staphylococcal infections has been established clearly, as has its adjunctive usefulness in acute gingival and periodontal infections, notably acute necrotizing gingivitis.

It will rarely be necessary for the dentist to employ other antibiotics except where penicillin is definitely contraindicated. Within recent years many individuals have become sensitized to penicillin and penicillin-resistant strains of bacteria are often encountered. The rising frequency of bacterial resistance and patient sensitization to penicillin is a matter of special concern to the dentist who is required to treat infections usually in ambulatory patients and almost always without the benefit of laboratory facilities by which to test either the drug-resistance of the bacteria involved or the sensitivity of the patient to penicillin. Authoritative reports[1,2] indicate that the value of penicillin should be carefully weighed against the risks of serious complication in any of the following situations:

1. Patients with a history of sensitivity to penicillin.
2. Patients with a history of urticaria, eczema, bronchial asthma or allergy to pollens, foods, drugs or bacteria.

Other antibiotics may be employed in these situations and in patients with infections in whom administration of penicillin has failed to bring about remission within a reasonable period of time.

Several of the so-called broad-spectrum antibiotics have been shown to be useful in the treatment of infections in and about the oral cavity. In comparison with the voluminous literature on penicillin, however, relatively few reports are available on the dental use of these preparations. The growing trend toward the use of chlortetracycline, oxytetracycline and tetracycline in dentistry is not paralleled by the increase in the number of infections due to gram-negative or penicillin-resistant gram-positive organisms. Probably the tetracyclines have been prescribed more often because of the convenience of oral administration than because a broad-spectrum antimicrobial agent is required.

Carbomycin and erythromycin, two closely related antibiotics that are effective primarily against gram-positive organisms, are available. Evidence has appeared to indicate the value of these drugs as prophylactic agents against the

1. Welch, H., and others. Acute anaphylactoid reaction attributable to penicillin. Antibiotics & Chemotherapy 3:891 Sept. 1953.

2. Brown, E. A. The prevention of anaphylactic reactions to penicillin. (Editorial) Antibiotic Med. 1:439 Aug. 1955.

effects of bacteremias in penicillin-sensitive patients whose history suggests the need for this protection. These agents appear also to be especially useful in treating proved streptococcal and staphylococcal infections due to organisms resistant to penicillin but with demonstrated susceptibility to erythromycin or carbomycin. It should be stressed, however, that sufficient evidence is lacking as yet to warrant consideration of either of these two antibiotics on an equal basis with penicillin or the tetracyclines as adjunctive aids in treating acute gingival and periodontal infections.[3]

### CARBOMYCIN AND ERYTHROMYCIN

Carbomycin and erythromycin show similarities in several respects. They are effective almost exclusively against gram-positive bacteria, rickettsia and some of the large viruses. They are generally ineffective against gram-negative microorganisms (except certain neisseria and *Hemophilus pertussis*).

Bacterial resistance to each of them is developed readily *in vitro*, and bacteria that are resistant to one frequently exhibit cross-resistance to the other. Their absorption and excretion characteristics are similar in many respects, and each has been shown to consist of two active chemical components.[4] The erythromycin that has been purified for use in certain preparations is somewhat more effective than carbomycin on a weight basis.

### CARBOMYCIN

*Properties* • The properties of carbomycin recovered from cultures of *Streptomyces halstedii* were first reported by Tanner and co-workers.[5] The free base, from which salts are readily formed with acids, is a white crystalline material melting with decomposition at 199.5 to 200.5°C. It is only partially soluble in water, but the sulfate and the hydrochloride are water soluble. Solutions of the salts are stable for at least one week at refrigerator temperatures; freezing causes a considerable fall in potency.

*Administration* • Carbomycin is administered orally.

*Antimicrobial Activity* • Carbomycin is effective principally against gram-positive bacteria, certain large viruses and rickettsia. *In vitro* it has been shown that organisms may acquire resistance to carbomycin in a manner similar to the development of resistance to penicillin. Organisms resistant to penicillin are usually susceptible to carbomycin, however, and it is in treating infections due to penicillin-resistant gram-positive bacteria that carbomycin finds its most important use. Strains of staphylococci that exhibit inherent resistance to carbomycin *in vitro* have been reported.[6] Cross-resistance has been demonstrated between carbomycin and erythromycin,[7] indicating a possible similarity of the chemical structure of the two drugs, but no cross-resistance has been observed between either of them and any of the other antibiotics in common use. On the basis of weight, the activity of carbomycin *in vitro* is considerably less than that of penicillin.[4] It has also been reported to be less effective than penicillin and other antimicrobial agents in certain types of pneumococcal and staphylococcal infections;[6, 8] the poor clinical results obtained in these

3. Grimm, D. H., and Albertson, G. L. Clinical investigation in the use of erythromycin for infection of the oral cavity. Oral Surg., Oral Med. & Oral Path. 7:858 Aug. 1954.

4. Welch, Henry. Antibiotic therapy. New York Medical Encyclopedia, Inc., 1954, p. 169-189.

5. Tanner, F. W., Jr., and others. Some properties of magnamycin, a new antibiotic. Antibiotics & Chemotherapy 2:441 Sept. 1952.

6. Hewitt, W. L., and Wood, J. P. Laboratory and clinical experience with carbomycin. New England J. Med. 249:261 Aug. 13, 1953.

7. Finland, M., and others. Cross resistance to antibiotics: effect of exposures of bacteria to carbomycin or erythromycin in vitro. Proc. Soc. Exper. Biol. & Med. 81:725 Dec. 1952.

8. Finland, M., and others. Carbomycin therapy: results of a brief clinical trial chiefly in patients with pneumonia. New England J. Med. 249:310 Aug. 20, 1953.

cases have been attributed to the low blood concentration of carbomycin obtained even with maximum tolerated doses. Excellent results have been reported, however, in a number of similar cases studied by other investigators.[9]

*Absorption* • The blood concentration of carbomycin after administration of single oral doses in man is variable.[4] There is some indication that carbomycin is rapidly transferred from the blood stream into a number of tissues and organs. Only a small fraction of the dose could be recovered from the urine,[8] suggesting that the drug is destroyed with relative rapidity in the body. These factors may account for the variability in blood concentrations found in both man and animals. Unlike erythromycin, carbomycin is not significantly affected by exposure to the gastric contents.

*Toxicity* • Carbomycin produces relatively few side effects when administered by mouth in doses of 1 Gm. or less. Higher doses may cause nausea and vomiting. Intramuscular administration of its soluble forms is followed by local irritation and pain. No dosage forms for parenteral administration are available for general use.

*Dosage* • Oral administration of 2 Gm. of carbomycin daily in 4 divided doses (500 mg.) has provided an adequate response in most severe cases; in refractory cases this may be increased to 1.0 Gm. every six hours, but in certain soft tissue infections 1.0 Gm. per day may suffice.

### ERYTHROMYCIN

*Properties* • Erythromycin is prepared from cultures of *Streptomyces erythreus.* It is a grayish-white compound, basic in reaction and forms salts readily with acids. It is available as the free base as the ethyl carbonate ester or as the stearate, lactobionate, and glucoheptonate salts; the latter two salts are relatively soluble in water and are suited for parenteral use. Erythromycin dissolves in water to the extent of about 0.2 Gm. per 100 ml. but it is very soluble in alcohol and ether. Aqueous solutions of the salts are reported to be stable for three weeks at 4°C., and for three or four days at 37°C.[10]

*Administration* • Erythromycin is usually administered orally. Soluble forms may be given by intravenous injection, however, either intermittently or by continuous drip.[11]

*Antimicrobial Activity* • Erythromycin is effective against gram-positive bacteria and has its greatest use in infections with those organisms that are resistant to penicillin. Erythromycin exerts some action against the neisseria, hemophilus and brucella groups as well as activity *in vitro* against some of rickettsiae and the large viruses.[4, 10] As with other antibiotics, some organisms develop resistance to erythromycin. Erythromycin-resistant forms are usually resistant to carbomycin also, but cross-resistance with penicillin has not been reported. Erythromycin has been employed with success in many streptococcal, staphylococcal and pneumococcal infections where penicillin has failed to control the situation.

*Absorption* • After an oral dose, the blood level of erythromycin usually reaches a peak in one or two hours, and declines sharply between the fourth and sixth hour. The drug undergoes considerable destruction by the gastric secretions unless it is protected either by a buffer or acid-resistant coating. After oral administration, urinary recovery of vari-

9. Field, W. W., and Taylor, G. An evaluation of carbomycin. Antibiotics & Chemotherapy 4:65 Jan. 1954.

10. Haight, T. H., and Finland, M. Laboratory and clinical studies on erythromycin. New England J. Med. 247:227 Aug. 14, 1952.

11. Herrell, W. E. Erythromycin. Antibiotic monograph no. 1. New York Medical Encyclopedia, Inc., 1955.

able amounts from 0.02 to 15 per cent of the dose have been reported. It is concentrated from the blood by the liver and appears in the bile, from which it is reabsorbed through the intestinal wall,[12] so that excretion is almost wholly by way of the kidney. Erythromycin appears to diffuse readily from the circulation into most of the organs and tissues of the body, but relatively slowly into the brain.

*Toxicity* • Erythromycin rarely produces untoward reactions in doses of up to 500 mg. every six hours. Gastric distress occurs in some patients receiving larger doses. No sensitivity reactions have been reported following systemic use; a few instances of sensitization have been observed, however, in connection with topical use of the drug.[13]

*Dosage* • Oral administration of 1.0 to 2.0 Gm. of erythromycin daily in 4 doses (250 or 500 mg. respectively) ordinarily is sufficient for the control of infections caused by erythromycin-sensitive organisms. Up to 4 Gm. daily may be given in severe cases.

12. Richardson, A. P. Chemotherapy of bacterial infections VII. Miscellaneous antibiotics. In Pharmacology in medicine, Drill, V. A. New York, McGraw-Hill, 1954, p. 80/1-80/6.

13. Livingood, C. S., and others. Erythromycin in local treatment of cutaneous bacterial infections. J.A.M.A. 153:1266 Dec. 5, 1953.

# Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics has been described in a previous report (J.A.D.A. 40:489 April 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically, and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions for acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees and the House of Delegates of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies* and may use the Seal of Acceptance, unless otherwise provided.

The following additional products are classified in Group A:

**Procaine HCl, U.S.P.** (See A.D.R. ed. 21, p. 25), **Epinephrine, U.S.P.** (See A.D.R. ed. 21, p. 91)

*Procaine HCl 2%, Epinephrine 1:50,000* (Graham Chemical Corporation): (See A.D.R. ed. 21, p. 29) Manufactured for the following distributor:

Lincoln Dental Supply Company

*Procaine HCl 4%, Epinephrine 1:65,000* (Graham Chemical Corporation): (See A.D.R. ed. 21, p. 29) Manufactured for the following distributor:

Lincoln Dental Supply Company

**Procaine HCl, U.S.P.** (See A.D.R. ed. 21, p. 25), **Tetracaine HCl, U.S.P.** (See

A.D.R. ed. 21, p. 34), **Phenylephrine HCl, U.S.P.** (See A.D.R. ed. 21, p. 93)

*Procaine HCl 2%, Tetracaine HCl 0.15%, Phenylephrine HCl 1:2,500* (Graham Chemical Corporation): (See A.D.R. ed. 21, p. 30) Manufactured for the following distributor:

Lincoln Dental Supply Company

**Benzethonium Chloride, U.S.P.** (See A.D.R. ed. 21, p. 86)

*McDow's Benzethonium Chloride Germicidal Tablets* (McDow Laboratories): Each 100 Gm. is stated to contain benzethonium chloride, 25 Gm.; sodium nitrite, 40 Gm.; sodium bicarbonate, 20 Gm.; ethylenediamine tetraacetic acid, 12 Gm.; magnesium stearate, 3 Gm., and color.

GROUP B

**Listing of products in Group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics. It is the Council's opinion that Group B products may be promoted for special use and study.**

**The Council's initial consideration of products which may be eligible for Group B listing is influenced favorably by the knowledge of further investigations then in progress. It is the policy of the Council to reconsider Group B products each year on the basis of new evidence which may be produced in their support. Classification in this category is not ordinarily continued for more than three years.**

The following additional products are classified in Group B:

**Erythromycin, U.S.P.** (See A.D.R. ed. 21, p. 58 and report on page 348)

*Erythrocin Stearate* (Abbott Laboratories): A brand of erythromycin stearate.

*Erythrocin Stearate Tablets (Filmtabs), 100 mg., 200 mg., 250 mg.:* Stated to contain erythromycin stearate, sodium citrate and excipients.

*Erythrocin Stearate Oral Suspension, Pediatric, 100 mg. per 5 cc.:* Each 5 cc. is stated to contain erythromycin stearate, 100 mg., sodium citrate, 15 mg., suspending agents, color and flavor. In bottles, 2 fluid ounces.

*Erythrocin Lactobionate* (Abbott Laboratories): A brand of erythromycin lactobionate.

*Erythrocin Lactobionate Sterile Vials, 300 mg.:* Each vial represents erythromycin base, 300 mg. and benzyl alcohol (as preservative), 54 mg. Addition of 6 cc. 5% dextrose or water provides a 5% (50 mg. per cc.) solution for slow intramuscular injection.

*Erythrocin Lactobionate Sterile Vials, 1 Gm.:* Each vial represents erythromycin base 1 Gm., and benzyl alcohol (as preservative), 180 mg. Addition of 20 cc. 5% dextrose or water provides a 5% (50 mg. per cc.) solution for slow intramuscular injection.

**Carbomycin** (See report on page 348)

*Magnamycin* (Pfizer Laboratories): A brand of carbomycin.

*Magnamycin Tablets, 100 mg., 250 mg.:* Stated to contain carbomycin and excipients.

GROUP C

**Listing of products in Group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that Group C products require further study by qualified investigators.**

GROUP D

**Listing of products in Group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.**

## Council reports change in status of Profie

In March 1953, it was announced that Profie Tablets, a polishing preparation manufactured by Laclede Laboratories, had been classified in Group C, because adequate evidence was not available to support certain therapeutic claims that appeared in the labeling and advertising material for the product. The firm now distributes Profie Paste, a ready-to-use product in a collapsible tube, whose basic composition is essentially similar to that of the tablets. Both preparations contain an enzyme mixture, in addition to polishing agents and excipients. It was claimed that the enzymes would aid in the removal of calculus, especially in locations that were accessible with difficulty to the periodontal scaler. The evidence offered in support of this claim was not conclusive.

The manufacturer has cooperated in sponsoring further investigation of the clinical effectiveness of Profie preparations. Until adequate evidence becomes available, however, the firm has agreed to withdraw from its promotional material all references which allude to calculus removal or to enzymic action, and to promote the products simply as polishing and cleansing preparations which may be useful and convenient in dental practice as adjuncts for oral prophylaxis.

The Council now regards Profie Paste and Profie Tablets as mechanical aids for which no therapeutic use is implied. Evidence demonstrating that the products are not toxic or locally harmful to the oral tissues is on file in the Council office. In view of these considerations, the Council has declared Profie Tablets and Profie Paste to be outside the scope of its program for classification of therapeutic agents.

BUREAU OF LIBRARY AND INDEXING SERVICE

## The American Dental Association Film Library

The Film Library circulates not only films and filmstrips but also 2 by 2 slides which can be used in education of patients in a dental office or dental clinic, for study clubs, dental schools, community and civic groups. Investigation of new sources of material, their preview and selection as well as review of old materials are regular procedures followed by the Film Library to keep the collection up to date. Materials found to be obsolete are withdrawn from circulation and replacements are made.

The 2 by 2 slides on preventive orthodontics for nonprofessional groups reviewed in this article have been prepared to replace two series listed in the *Catalog of the American Dental Association* and in the booklet, *Audio-Visual Materials in Dentistry,* as S15 and S16, "Occlusion and Malocclusion." These are available for rental ($1.50) from

the Film Library and for purchase ($1 each for color, $.55 each for black and white or $28.80 per set) from the Order Department of the American Dental Association, 222 E. Superior St., Chicago. It is suggested that all slides be reviewed prior to purchase. Slides sent on a rental basis cannot be kept for purchase but must be returned intact to the Film Library. Requests for the purchase of individual slides can then be directed to the Order Department. If slides available from the Association are purchased within 30 days after review, the rental fee of $1.50 can be deducted from the purchase price.

If any readers have prepared slides concerned with dentistry for children and development of tooth structure which they have found satisfactory in patient education or in illustrating lectures on dental health education before nonprofessional groups, the Film Library will appreciate hearing about them. It has been established practice for the owner or producer to give the Association permission to duplicate slides or other materials at Association expense.

Since the number of sets of slides is necessarily limited, it is suggested that program chairmen plan their programs far enough in advance to insure availability.

SLIDE REVIEW

*S15 Occlusion and Malocclusion* • 31 slides, 27 color, 4 black and white, with guide. Prepared by Touro M. Graber, D.D.S., Northwestern University Dental School, in cooperation with American Dental Association.

The purpose of this particular series, which is suitable for use in the education of patients in a dental office or dental clinic is to acquaint parents and nonprofessional members of community and civic groups with the scope of orthodontics. The topics covered are: kinds, causes, effects and treatment of malocclusion and fixed orthodontic appliances used in such treatment. The series begins with definitions of "occlusion" and "malocclusion" which are based on those printed in the American Dental Association, Bureau of Dental Health Education's pamphlet, *Dental Health Facts*. Under the topic, "Kinds of Malocclusion," examples illustrating overcrowded condition, severe open bite, anterior cross-bite and mandibular prognathism, are shown. This is followed by a series depicting various causes of malocclusion such as congenitally missing teeth, presence of supernumerary teeth, prolonged retention of deciduous teeth, premature loss of deciduous teeth and lack of replacement of lost permanent teeth, thumbsucking, and tongue-thrusting habits. Under the topic, "Effects of Malocclusion," some of the following conditions are covered: open bite malocclusion, incisors vulnerable to fracture because of protrusion, and gingival hypertrophy. This is followed by photographs of patients showing them before and after treatment. Under the topic, "Orthodontic Appliances" a removable plastic biteplate, a plastic guide plane, a band, a spur and intermaxillary elastic, a thumbsucking appliance and samples of fixed appliances for use in orthodontics are shown.

This series is well organized. The use of plaster casts, models, and patients increases its instructional value. Instead of presenting the series in its entirety at one lecture, the topics can be treated in separate lectures, which encourages and allows time for audience participation.

MARCH 1956

LON W. MORREY, D.D.S., EDITOR
VOLUME 52 • NUMBER 3
Published by the American Dental Association
222 East Superior Street • Chicago 11, Illinois

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

## *Editorials*

# Dentistry's next objective: more funds for dental research

The President's message on the health of the nation presented to Congress January 26 and his request for $126,525,000 for medical research has been accepted favorably by most of the sciences. The meager amount of funds requested for dental research, however, proved most disappointing to dentists.

Specifically, the amount requested for dental research for fiscal 1957 is less than three million dollars—$2,971,000 to be exact—compared to $32,437,000 for cancer research; $22,106,000 for heart disease study; $21,749,000 for mental illnesses; $13,345,000 for a study of arthritis and metabolic diseases; $12,196,000 for neurology and blindness; $9,799,000 for research in the fields of infectious and parasitic diseases, and $11,922,000 for the general research program of the National Institutes of Health.

Thus, as in years past, the makers of the federal budget suffer from chronic myopia when viewing the nation's needs for dental research as evidenced by the fact that the proposed grants for dental research for the coming year are less than 2.5 per cent of the total appropriations proposed for the National Institutes of Health.

It is difficult to understand, in light of the scientific information available to everyone in this country, how those in federal high places can continue to regard so lightly the prevalence and seriousness of dental disease.

It also is difficult to understand why men of national stature cannot appreciate the fact that a few dollars spent judiciously on dental research eventually will save the nation and each American family hundreds, perhaps thousands, of dollars.

Representatives of the American Dental Association appearing before the Appropriations Committee of the House of Representatives on February 17 requested that the government's dental research budget for fiscal 1957 be increased by $3,-

055,000 over the amount recommended by the Administration. Specifically the Association urged Congress to increase the appropriations for the U. S. Public Health Service dental health activities from $2,971,000 to $6,026,000 to augment and intensify the dental research program of the National Institute of Dental Research.

In addition, the Association requested Congress to appropriate funds for the construction of a separate building to house the National Institute of Dental Research—the building of which was authorized by Congress in 1948.

The Association's recommendations for an increase in funds for dental research are based on firm ground. Nonfederal research institutions, particularly the nation's 43 dental schools and other dental research institutions, have the capacity for conducting many more dental research projects than the few presently being supported by the National Institute of Dental Research. Studies by the Association indicate that at least $3,855,000 is required to unleash the dental research potentials of America's dental schools and other research institutions.

Recommendations for an appropriation to finance the construction of a separate building for the National Institute of Dental Research are equally well founded. At present, researchers at the National Institute of Dental Research are required to work in cramped quarters located in three separate buildings. As the activities of other Institutes expand, the space and the facilities of the dental scientists necessarily must be contracted to the detriment of dental research.

The time has long since passed when a nation as great as America can blithely dismiss as unimportant disorders that affect at least ninety-eight per cent of the population. Diseases of the mouth and other oral abnormalities are complex and varied. Many minds, trained in many disciplines, will be required to determine their causes and develop methods for their prevention—many minds, plus many hours of research and many types of modern intricate equipment, all of which cost money. And, since dental disorders, because of their prevalence, are public health problems, it is fitting that the public contribute toward their solution. Dentistry believes that the public is willing and able to do so. The task is to make the Administration and the Congress to believe so. This is the task the Association has set for itself. This is the responsibility which it asks the constituent and component societies to help shoulder in the interest of public health, preventive dentistry and national economy.

## Mouth protectors for football trainees

During the next few weeks the playgrounds of America—the supervised playgrounds, the sand lots and athletic fields—will come alive with millions of the nation's youngsters who, shaking off the gray blankets of winter, will revel in the animal luxury of stretching and straining and tiring unused muscles.

Play and sports are inherited privileges of American youth, and who would deny them those privileges? But play and sports—particularly contact sports which seem to be especially popular in America—carry an element of danger. Parents and other staid adults, unlike the youthful participants, are torn between worry over these dangers and the pleasure stimulated by the excitement of the contest. Dentists, par-

ticularly, are concerned over the dental damage that frequently occurs in football, much of which takes place in spring training.

Last year, according to the National Federation of State High School Athletic Associations,[1] 286 high school football teams in ten states reported 330 serious accidents which required the services of a physician or dentist. Twenty-two per cent, or almost one quarter of these accidents, involved the teeth and nose. Two boys received fractured jaws, one injured his tongue, one player lost four upper incisors and two others lost two upper incisors each. Mr. H. V. Porter, secretary of the National Federation of State High School Athletic Associations,[2] reports an even higher percentage of football dental accidents for the nation as a whole. Approximately 54 per cent of all high school football injuries, he states, are facial and dental.

Most—perhaps all—of these dental injuries could have been prevented had the players been required to wear mouth protectors.

The athletic departments of our schools and colleges have done a remarkable job in developing devices for the protection of football players; however, most such devices have been designed to protect parts of the body other than the face and mouth.

According to other investigators,[3] high schools spend from 90 dollars to 120 dollars annually to protect areas of the football player's body exposed to only 48 per cent of the injuries, and they point out that a protective mouthpiece can be purchased for half the cost of a pair of football shoes—and for less than the laundry bill for each member on the team. "More money is spent . . . to 'patch up' broken teeth each year than it would cost to outfit the entire team with protective mouthpieces."

If one can judge by the increasing number of reports received from different sections of the country, dental societies are not unmindful of this serious problem, and many are taking steps to help solve it. One of the most recent and most encouraging reports comes from New York's Nassau County Dental Society.[4] Findings from the Nassau dental society project indicate that football players who wear mouth protectors rarely suffer dental injuries; those who wear face masks receive a few, and nearly 12 per cent of those who play without protection can expect damaged teeth. Of 151 Nassau youngsters equipped with mouth protectors, not one sustained tooth damage. Of 244 players not protected 29, or 11.7 per cent, received some dental injury.

The Nassau study corroborates the findings in other areas, and it points out a public relations, preventive dentistry task that might well be undertaken by other dental societies. Dentists not only have the right to be concerned over the football dental injuries sustained by the youth of their community, but they have the right and the obligation of initiating measures to reduce the incidence of such injuries to a minimum. And this is the time of the year to initiate such action—at the beginning of spring training season.

1. National Federation of State High School Athletic Associations. Report of Safety Equipment Conference, Chicago, Dec. 19, 1955.

2. Athletics a part of education. Editorial. Athletic Journal 36:26 Nov. 1955.

3. Watts, George; Woolard, Archie, and Singer, Carl E. Functional mouth protectors for contact sports. J.A.D.A. 49:7 July 1954.

4. Rubber mouth protectors. Washington Post, Jan. 11, 1956.

On Capitol Hill in the weeks to come, the question of dental and medical manpower in the Armed Forces promises to be a much debated subject.

If Congress pursues the matter to a clear-cut decision, the outcome of its deliberations may have wide ramifications. These are some of the issues involved: The doctor draft law, and how it should be administered and whether it will be extended beyond June 1957; health services, including dental care, for dependents of military personnel; continuation of the military's graduate training programs for dental and medical officers; determination of ratios, per total active duty strength, of dental and medical officers; and, finally, ways and means by which professional careers in the Armed Forces may be made more attractive for dentists and physicians.

In mid-February the House Armed Services Committee opened a series of public hearings on career inducements. With this subject as a vehicle, it was regarded as certain that the committee would take a careful inventory of the military's numerous dental and medical manpower problems. Such aspects as this Congressional group might overlook or touch upon only lightly will be examined when the Senate Armed Services Committee conducts its own hearings on the subject this spring.

The thoroughness with which a subcommittee, under the chairmanship of Rep. J. Kilday (D., Texas), went into the question of dependents' medical and service care benefits recently is indicative of the concern and attention which Congress is focusing on the supply of physicians and dentists for the Army, Navy and Air Force. Although the subcommittee approved a bill which authorizes the Defense Department to contract for professional care of dependents by civilian practitioners, either on a fee or prepaid insurance basis, provision was included for continuation of health services by military medical and dental officers in military facilities.

Spokesmen for Army, Navy and Air Force medical departments were emphatic in their arguments that total surrender of dependent care to civilian auspices would not only be unfair to wives and other family members who prefer to get their care in military dispensaries and hospitals but would be a major setback in the current campaign to increase the attractiveness of uniformed career service in medicine and dentistry.

### FURTHER STUDY DUE

Because of this interlocking relationship between dependents' care and career service inducements, the House Armed Services Committee has deferred final action on the former until it has made a penetrating study of the latter. And this study will involve, as previously indicated, a review of what has been accomplished under the five-year-old doctor draft law; discussion of the effect on military medical and dental manpower requirements of dependents' health services; consideration of existing ratios of medical and dental officers per active duty strength, and other factors.

A ruling published several weeks ago by the Internal Revenue Service is applicable to dental as well as to medical practice groups. In substance, the ruling is that doctors engaged in group practice who form an association in order to obtain the tax benefits of corporate status remain, nevertheless, a partnership.

Members of such a group are partners,

rather than employees, hence they do not qualify for establishment of pension plans under Section 401(a) of the Internal Revenue Code, it was held.

The formal ruling was issued as the result of inquiries which had been received following a federal court decision. In the case of a medical clinic in Montana, the court held that its association of physicians fulfilled the criteria of a corporation, rather than a partnership, for tax purposes. On appeal, the government lost. Nevertheless, the Internal Revenue Service has ruled that the decision "will not be accepted by the Internal Revenue Service as a precedent in the disposition of other cases involving similar fact situations."

### DENTAL SCHOOL CONSTRUCTION

Although Administration-sponsored and Democratic bills have been introduced in both branches of Congress authorizing federal grants to encourage construction and expansion of dental teaching and research facilities, committee action on these measures is not yet in sight.

Biggest stumbling block, in the opinion of informed observers, is the potential danger of opening another Pandora's box. In this case, the irritant would be the racial segregation issue. Just as federal school construction assistance has been delayed by demands that funds be denied those states resisting integration in the public schools, a similar stalemate could arise in connection with proposed construction grants for dental schools and dental research centers. Accordingly, although nothing is being said on the subject publicly, the Congress members identified with steering health legislation are biding their time with the new training and research bills pending a solution to the public school aid question.

# *International Correspondence*

## NEWS FROM GREAT BRITAIN

W. Stewart Ross writes that British dentistry can be assured that 1956 will be of outstanding interest. Indeed it may well prove to be one of the most important of the 75 years of the life of the British Dental Association.

The dentists' bill will pass through its final stages and will become law, the dental profession will have gained independence and autonomy and the new Dental Council will be in existence toward the end of the year. Steps will then be taken to start the experiment of training dental ancillaries, who will be taught to extract and fill teeth under the supervision of qualified dentists.

The interdepartmental committee set up by the government to study the causes of the lack of recruitment into the dental profession will complete its work and will draft a report to be presented to the Ministry of Health. In the meantime, there is already welcome news that the 19 dental schools in Great Britain and Northern Ireland are filling up their vacancies, and it may well be that the need to raise the numbers in the profession will be met by an enlargement of existing schools and the building of new ones.

Government plans to start four investigation centers to study fluoridation of the communal water supplies should soon be under way, in spite of the antagonism created by a small but vociferous group of critics.

During this year Sir Wilfred Fish will assume the role of director of dental research at the Royal College of Surgeons, and the beginning of the first dental research center at the College will have been made.

### NATIONAL HEALTH SERVICES

The report of the chief medical officer on the state of the public health for the year ended December 31, 1954, is now published by Her Majesty's Stationary Office (Cnd. 9627) and was presented by the Minister of Health to Parliament December 1955. In chapter 10 on dental health services, Dr. W. Senior, principal dental officer, refers again to the disturbing prospect created by the fall in dental manpower.

The prophylactic dental care of expectant mothers with a treatment rate of only 6 per cent is disappointing. Conservative dental treatment of preschool children is showing an increase. Statistics are given of a survey carried out by G. L. Slack into the incidence of dental decay in 1,909 Liverpool day nursery preschool children during the period 1948-52. He found that 7 per cent of the deciduous second molars were decayed before the children were two years old and over 45 per cent before the children reached five years.

The average number of decayed, extracted and filled deciduous teeth per child at age five varied between four and five. A striking fact was that only 11 out of the 1,909 had any fillings. Mr. Slack cites figures to illustrate the manpower problem as it affects one large city, showing that 26 full-time dentists would be needed to deal with the four to five year old group alone, whereas there are 24 dental officers in Liverpool to deal with the whole school and preschool population.

This situation applies more or less to Great Britain as a whole. Mr. Slack draws attention to the necessity for using ancillaries to help the dental officer, to the importance of preventive measures and to the proved value of fluoridation in the United States. He also strongly advises plain water rinsing after all eating and drinking.

The hospital dental services are making headway, and there is improvement in the provision made for dental care in mental hospitals. The establishment of dental laboratories to serve the hospitals is an innovation which is finding favor as a means of effecting economy in the manufacture and repair of dentures and in providing a more rapid service for the patient.

During the year studies in readiness for the fluoridation of certain water supplies were undertaken.

### THE DENTAL BOARD

Sir E. Wilfred Fish, in his chairman's address for the 69th session of the Board, spoke of the passing out of existence of the present Board when the new dentists' bill is approved by Parliament. "It should be reassuring to those of our colleagues who, for one reason or another, have felt constrained to resist the passage of this Bill to read the first clause that the all-embracing purpose of the General

Dental Council which it seeks to set up is 'To promote high standards of professional education and professional conduct among dentists.'

"Such criticism as one has heard of the measures may well have arisen because it has not always been appreciated that the Bill does not propose to place the government of the profession in the hands of some austere and remote power, but provides for self-government through our own elected and appointed representatives. The functions of the proposed Council are definitely limited and precisely defined, and the composition of the Council is dictated by the nature of those functions.

"Moreover, the work of the Council will be largely carried out by statutory committees, and the membership of each of these is also laid down in the Schedule to the Bill to ensure even more closely that the most appropriate people will be chosen to perform the various duties assigned to each committee. Education may be controlled by those directing it, discipline by those who know the pitfalls and temptations of general practice, and matters pertaining to ancillary service by those who have to train and direct the work of those engaged in it.

"In every case it is government of the profession, by the profession and for the profession, and it is difficult to see how we could have been given greater control of our destiny, having regard to the needs of the community at large as assessed by the responsible Minister of the Crown."

## ITEMS OF INTEREST

The news that Professor Miles has been appointed curator of the Odontological Museum will bring satisfaction to the friends of the late Sir Frank Colyer, for so many years curator of this famed collection. The museum has attracted many scholars and research workers from all parts of the world and has been visited by distinguished individuals. Soon the museum will be housed in the new building of the Royal College of Surgeons of England alongside the department of dental science in surroundings and position worthy of the importance of this world famous museum.

The American Dental Society of London held its regular monthly meeting at the Royal College of Surgeons, with Prof. A. B. Macgregor, dean of the Dental School, University of Birmingham, giving a paper entitled "Modern Research and Modern Practice."

Prof. M. Rushton writes that the next annual meeting of the British division of the International Association for Dental Research will be held at Liverpool April 13 and 14. Any members of I.A.D.R. who will be in Britain at that time will be welcome at the meeting. They are asked to notify the honorable secretary, Dr. M. V. Stack, Dental School, University of Bristol of their intention to be present and will then receive detailed information.

Mr. F. J. Ballard is to be congratulated on receiving the honor of Commander of the British Empire in the New Year honors. This public recognition of service to the dental profession will be applauded by his many friends and colleagues.

The provisional program of the 1956 annual conference of the British Dental Association to be held in Brighton, Sussex, (60 miles from London on the coast) June 25-29 is now published in the *British Dental Journal*, January 17, 1956, page 63. All details may be obtained by applying to Mr. H. Parker Buchanan, secretary, British Dental Association, 13 Hill St., London, W.1.

The British Dental Association has published a list of those members of the Association who do no dental practice in connection with the General Dental Services. They total 193 out of a total membership of approximately 11,000, and of the 193, 73 are practicing in London. Without doubt some names are omitted by mistake from the list, but the figures tell the tale of how the dental profession is taking part in the General Dental Services.

*G. H. Leatherman,*
*D.M.D., F.D.S., R.C.S., F.A.C.D.*

## ASSOCIATION ASKS MORE MONEY FOR RESEARCH, AUTHORIZATION FOR DENTAL CARE PLANS IN MILITARY DEPENDENTS BILL, VOLUNTARY O.A.S.I.

As the second session of the 84th Congress reached the midway point of its second month, a number of bills of major interest to dentistry were already being considered by Congressional committees. Association representatives had presented to the lawmakers organized dentistry's viewpoint on Old Age and Survivors' Insurance, on dental care for dependents of military men, on proposed government dental research appropriations and on the Career Incentive Bill, a measure designed to make careers in military medicine more attractive.

### ASK SIX MILLION FOR DENTAL RESEARCH

A recommendation that the federal government spend six million dollars in 1957 for dental research was made to a House Appropriations Subcommittee by Harold Hillenbrand February 17. The amount is more than twice that proposed in the government budget now being considered by Congress. The increase would be earmarked entirely for research projects.

While the Association secretary was testifying that the doubling of research funds is justified "in terms of human health and in the productive expenditure of funds," dental societies and individual practitioners also were telling Congress of the need for research. Hundreds of telegrams and resolutions from all over the country were being received on Capitol Hill.

The week previous, an *A.D.A. Information Bulletin* with background information on research needs and programs went out to all members. Meanwhile, a bill to increase from two to five million the amount authorized for a building for the National Institute of Dental Research was introduced in the House by Rep. J. Percy Priest (D., Tenn.), chairman of the House Committee on Interstate and Foreign Commerce. The Senate will consider a companion measure sponsored by Sen. James E. Murray (D. Mont.) and seven of his fellow Senators.

Dr. Hillenbrand asked that a total appropriation of $6,026,000 be made for the research activities of the National Institute of Dental Research. The Budget Bureau had recommended $2,971,000. Of the 3 million dollar increase proposed by the Association official, $330,000 would go to continue research projects now in operation, $870,000 for projects approved prior to July 1 by the NIDR and $2,655,000 for new projects in non-federal institutions.

"In the past few years, the interest of the federal government in the health research problems has expanded greatly, but dental health problems have not been a notable beneficiary of this increased interest," Dr. Hillenbrand said. He pointed out that while budgetary increases allocated to the other Institutes of Health had increased as much as 6,000 per cent, that allowed for dental research had gone up only 23 per cent.

(The Budget Bureau proposal would give dentistry 2.3 cents of the federal research dollar. At present, sufficient funds have been appropriated to support only 45 dental research projects, scarcely one each for the nation's 43 dental schools and seven research centers. A survey of the Association's Council on Dental Research showed that at least 265 addi-

tional research projects could be productively launched during the next year if funds were available.)

The dental executive reminded the Congressmen that dental caries is the most prevalent disease in the United States. Moreover, "75 per cent of the people who lose teeth lose them because of periodontal disease. Twenty per cent of our children suffer from severe deforming irregularities of the teeth. One child out of every 800 born alive suffers from the severe deformity of cleft palate and lip. Twenty-five per cent of the adult population is wearing one or two full dentures," he said.

"It is obviously futile to attempt to continue to solve a problem of this proportion by the endless treatment of the disease after it occurs," Dr. Hillenbrand asserted. Only research can provide the methods of prevention and control, he said. Dr. Hillenbrand cited fluoridation as a prime example of the value of research. That public health measure which was achieved through research cuts tooth decay in children by about 60 per cent, he pointed out.

The civilian dental bill runs one and a half billion dollars a year, Dr. Hillenbrand told the Congressmen. The government spends annually about 100 million dollars for the dental health care of the military. In addition, the VA spent a quarter of a billion dollars for dental care from 1948 to 1953, he said.

"In 1956, the VA dental program will cost an estimated 18 million dollars, an apparent saving of about $30,000,000 over the previous average annual cost of the program," Dr. Hillenbrand said. "If as little as 10 per cent of this saving, previously expended on terminal dental treatment, were now dedicated to an expanded dental research program, not only would the federal government eventually be able again to meet its full responsibility for the dental health of veterans, but it would also be an inestimable contribution to all of the people of this nation," the Association secretary stated.

Dr. Hillenbrand also urged the Congressmen to support (H.R. 9087), the Priest bill, which would increase a 1948 authorization for a National Institute of Dental Research building from 2 to 5 million dollars. At present, the facilities of the institute are scattered in borrowed space throughout several buildings.

### BILL INTRODUCED FOR VOLUNTARY O.A.S.I.

On February 8, Paul E. Jones, chairman of the Association's Council on Legislation, appeared before the Senate Committee on Finance, to present the Association's views on Old Age and Survivors' Insurance. The committee was considering H.R. 7225, the O.A.S.I. amendments already approved by the House, which include compulsory coverage for dentists. Meanwhile, a bill providing for voluntary coverage was introduced by Frank B. Carlson (R., Kan.) and was also referred to the Committee on Finance.

Dr. Jones, in his testimony, supported the elective inclusion of self-employed dentists in O.A.S.I. as the "most equitable and suitable method for applying the program to self-employed dentists." The Council chairman reported to the Senators that 72 per cent of the Association's delegations voting at the San Francisco annual session had approved voluntary coverage for dentists.

In addition to representing most fairly the viewpoints of members of the dental profession, elective coverage is practical, Dr. Jones testified. He denied that an elective policy would encourage only the "bad risks" to choose coverage.

"That result, if it occurred, would be only temporary," he said. Long range, it would not apply as, according to the amendment proposed by the Association, those electing coverage would have to do so within two years after starting to practice. At that time, the individual would have no way of predicting his

potential gain or loss from the program, Dr. Jones asserted.

Elective coverage is practical also from an administrative viewpoint, Dr. Jones told the committee. He reminded the Senators that today clergymen may elect or refuse coverage. "There is, therefore, already a statutory method for covering individuals on an elective basis," he pointed out.

Later in his testimony, Dr. Jones urged the Senators to amend the law so that dentists nearing age 65 and those beyond that age would have the opportunity to receive maximum retirement benefits. He also presented the Association's stand opposing the tying of disability benefits to state vocational rehabilitation programs as provided in the bill. (H.R. 7225 would make cash payments to disabled persons at age 50 provided they take part in a state rehabilitation program.)

"The effectiveness of vocational rehabilitation is dependent upon the desire of the disabled individual to make himself employable," Dr. Jones said. "Disabled O.A.S.I. beneficiaries should participate in the state plans only if they desired to be rehabilitated," he asserted.

Among other members of the dental profession appearing before the committee was Kenneth Haggerty of Arlington, Va. Dr. Haggerty, who testified for the Arlington County Dental Society, recommended that dentists be omitted entirely from the program if an elective system could not be adopted.

Testimony presented by three other dentists indicated a willingness to accept a voluntary program but indicated also that compulsory coverage would be an acceptable alternative.

The dentists were Harry I. Wilson of Des Moines, Iowa, secretary of the Iowa State Dental Society; F. E. Nicklaus of Bath, N. Y., on behalf of the Dental Society of the State of New York, and Gerald Shapiro of New York City for the First District Dental Society of the State of New York.

A mandatory system of coverage for dentists was urged by Merton E. Sawtell of Brockton, Mass., for the Massachusetts Dental Society; L. Dale Weeks of Des Moines and Earl S. Elman of Chicago, for the Congress of American Dentists for O.A.S.I., which claims to represent 11,000 dentists.

Hearings on the measure are expected to continue for at least a month.

### SUGGEST PLAN FOR CIVILIAN CARE OF MILITARY FAMILIES

A proposal to allow the use of dental health care prepayment plans as a method of providing care to dependents of military personnel was recommended to a House committee late in January. J. Claude Earnest, vice-chairman of the Council on Legislation, told a subcommittee of the House Armed Services Committee that such a provision should be included in H.R. 7994, the Armed Forces Dependents Medical Care Act being considered by the committee.

The bill is designed to permit private insurance programs to be used in providing medical and hospital care by civilian doctors for dependents of servicemen. The government would pay the insurance premiums.

As the bill stands, however, no provision is made for providing dental health care through an insurance scheme. In addition, even those dental services now available under Blue Cross and Blue Shield would apparently be excluded.

In his testimony, Dr. Earnest told the Congressmen of pilot dental health care prepayment plans now in operation. "Although there is not enough evidence, today, that the insurance principle can be applied generally to the cost of dental health care," he said, "there is increasing evidence that many types of dental service might be economically prepaid."

For this reason, Dr. Earnest stated, the bill should permit the Secretary of Defense "to extend to dependents, at some

future date, an opportunity to have a portion of the cost of their dental health care obtained from civilian sources borne by the federal government."

Dr. Earnest suggested also that overseas commanders be allowed to contract with civilian dentists for dependent dental care in the same manner as they are authorized to contract for medical care.

### CAREER INCENTIVE PROGRAM OFFERED BY DR. EARNEST

A few weeks after testifying on the military dependents' health care bill, Dr. Earnest appeared again before a Congressional committee. On February 16, he offered to a subcommittee of the House Armed Services Committee a two point program to make careers in military medicine more attractive. He proposed that civilian dental internships be included in computing constructive service credits for dental officers, and that a program be established whereby medical and dental officers who sign up for periods beyond the period of obligated service would receive additional pay.

The bill at present provides constructive service credits for the four years of medical or dental school and for medical, but not dental, internships. Service credits affect the officer's rank, pay and seniority standing. A Defense Department proposal for extended service incentive pay was deleted by the Budget Bureau.

"A Dental Corps staffed primarily with career officers would be more efficient, better trained to its military and ancillary missions, and less costly to maintain," Dr. Earnest stated. He warned the Congressmen that the alarming rate at which the career officer strength of the Dental Corps is being depleted threatens the career officer procurement program.

"Unless the income level of career personnel can be revised to reflect more closely the rewards of civilian practice, it is doubtful whether this program can be completely successful," he said.

### 40 MILLION PROPOSED FOR DENTAL SCHOOL CONSTRUCTION

Additional bills of importance to dentistry will be the subject of Association testimony at a later date. Some 40 million dollars for construction grants to promote dental research and teaching is provided in a bill introduced by Chairman Priest of the House Interstate and Foreign Commerce Committee. The money earmarked for dentistry is part of a five year, 250 million dollar project to be administered, according to the bill, by the U. S. Public Health Service. The USPHS Surgeon General would be advised by a 16 man council, at least half of whose members would be leaders in the health sciences. Institutions eligible for aid would have to match federal funds on a 50-50 basis.

Also in the Congressional hopper are Senate and House bills to assist states in providing additional medical and dental care for the indigent. The bills amend the public assistance features of the Social Security Act.

## Association Affairs

### RELIEF FUND OVER THE TOP AHEAD OF LAST YEAR

The 1955-56 Relief Fund went over the top February 20 to beat last year's completion record by eight days. It was the fourth consecutive year that the $100,000 goal had been surpassed. On February 20, contributions reached $102,022.58. A year ago the quota was not passed until February 28. As of mid-February this year, the last date for which a breakdown of contributions by states was available, funds paid in by the constituent societies were as follows:

*Quota of $1,000 or more*

| | Quota | Contributions to Feb. 15 | Pct. |
|---|---|---|---|
| California | $ 3,770.00 | $ 3,785.00 | 100.4 |
| So. California | 4,720.00 | 8,185.50 | 173.4 |

| | | | |
|---|---|---|---|
| Connecticut ... | 1,940.00 | 1,729.00 | 89.1 |
| Florida ..... | 1,420.00 | 1,419.00 | 99.9 |
| Georgia ..... | 1,070.00 | 1,126.00 | 105.2 |
| Illinois ..... | 7,120.00 | 7,641.50 | 107.3 |
| Indiana ..... | 2,270.00 | 2,356.93 | 103.8 |
| Iowa ..... | 1,780.00 | 1,719.00 | 96.6 |
| Kansas ..... | 1,000.00 | 1,013.30 | 101.3 |
| Kentucky ..... | 1,160.00 | 673.00 | 58.0 |
| Louisiana ..... | 1,020.00 | 900.50 | 88.3 |
| Maryland ..... | 1,100.00 | 1,154.00 | 104.9 |
| Massachusetts .. | 3,660.00 | 1,450.11 | 39.6 |
| Michigan ..... | 4,090.00 | 3,770.90 | 92.2 |
| Minnesota ..... | 2,770.00 | 2,690.81 | 97.1 |
| Missouri ..... | 2,420.00 | 2,118.00 | 87.5 |
| Navy ..... | 1,050.00 | 499.00 | 47.5 |
| Nebraska ..... | 1,000.00 | 1,084.00 | 108.4 |
| New Jersey..... | 4,010.00 | 4,041.00 | 100.8 |
| New York..... | 15,020.00 | 10,244.00 | 68.2 |
| North Carolina . | 1,300.00 | 1,343.00 | 103.3 |
| Ohio ..... | 4,940.00 | 4,181.50 | 84.6 |
| Oregon ..... | 1,270.00 | 1,233.00 | 97.1 |
| Pennsylvania ... | 6,790.00 | 4,635.50 | 68.3 |
| Tennessee ..... | 1,360.00 | 4,701.50 | 345.7 |
| Texas ..... | 3,240.00 | 2,114.00 | 65.2 |
| Virginia ..... | 1,190.00 | 1,193.50 | 100.3 |
| Washington ... | 1,810.00 | 1,982.00 | 109.5 |
| Wisconsin ..... | 2,950.00 | 2,262.50 | 76.7 |
| Total ..... | $87,240.00 | $81,247.05 | 93.1 |

*Quota under $1,000*

| | Quota | Contributions to Feb. 15 | Pct. |
|---|---|---|---|
| Air Force .....$ | 540.00 | $ 337.25 | 62.5 |
| Alabama ..... | 820.00 | 1,505.00 | 183.5 |
| Alaska ..... | 50.00 | 224.00 | 448.0 |
| Arizona ..... | 310.00 | 385.50 | 124.4 |
| Arkansas ..... | 550.00 | 632.00 | 114.9 |
| Army ..... | 520.00 | 268.50 | 51.6 |
| Colorado ..... | 970.00 | 1,074.00 | 110.7 |
| Delaware ..... | 150.00 | 165.00 | 110.0 |
| Dist. of Col.... | 800.00 | 660.50 | 82.6 |
| Hawaii ..... | 370.00 | 545.00 | 147.3 |
| Idaho ..... | 290.00 | 331.00 | 114.1 |
| Maine ..... | 460.00 | 356.50 | 77.5 |
| Mississippi .... | 540.00 | 424.00 | 78.5 |
| Montana ..... | 360.00 | 483.00 | 134.2 |
| Nevada ..... | 100.00 | 177.00 | 177.0 |
| New Hampshire. | 320.00 | 316.50 | 98.9 |
| New Mexico.... | 250.00 | 284.00 | 113.6 |
| North Dakota .. | 320.00 | 450.05 | 140.6 |
| Oklahoma ..... | 900.00 | 865.00 | 96.1 |
| Panama C. Z. .. | 20.00 | 22.00 | 110.0 |
| P. H. Service ... | 200.00 | 220.50 | 110.3 |
| Puerto Rico .... | 240.00 | 231.25 | 96.4 |
| Rhode Island .. | 550.00 | 680.00 | 123.6 |
| South Carolina . | 470.00 | 365.00 | 77.7 |
| South Dakota .. | 320.00 | 494.00 | 154.4 |
| Utah ..... | 480.00 | 367.50 | 76.6 |
| Vermont ..... | 190.00 | 235.00 | 123.7 |
| Vet. Admin..... | 770.00 | 358.50 | 46.6 |
| W. Virginia ... | 740.00 | 620.50 | 83.9 |
| Wyoming ..... | 160.00 | 160.00 | 100.0 |
| Total ..... | $12,760.00 | $13,238.05 | 103.7 |

## COUNCIL CALLS THREE DAY WORKING CONFERENCE

The Council on Dental Health will sponsor its Seventh National Dental Health Conference May 14-16 in Chicago, R. F. D. Johnson, Council chairman, has announced. This year's three day conference marks a change from the previous pattern of one day programs preceding the Association's annual session. The change was made, Dr. Johnson stated, to allow conferees time for thorough discussion.

Under discussion will be ways to improve the functioning of state society councils on dental health and methods for improving state health department dental services. Also to be considered will be the role of dental health service corporations and private insurance companies in third party administration of group dental health care programs. Public assistance, vocational rehabilitation and chronic illness programs will be analyzed by the conference. Morning presentations by authorities in the field will be followed by workshop sessions.

## FLUORIDE DENTIFRICE SALE PREMATURE, ASSOCIATION SAYS

There is no adequate evidence that any of the fluoride dentifrices now being offered to the public is effective in preventing tooth decay, Harold Hillenbrand, Association secretary, said in a formal statement issued early in February. The statement was made in reply to a large number of inquiries regarding Crest with Fluoristan, the latest fluoride tooth paste to be offered to the public. The dentifrice, which is being widely advertised, is manufactured by Procter and Gamble.

"The American Dental Association is not aware of evidence adequate to demonstrate the claimed dental caries prophylactic value of Crest," stated Dr. Hillenbrand. "Evidence of the value of adding a fluoride in other dentifrices is even less convincing. Therefore, the Association believes that all fluoride dentifrices are being marketed prematurely," he said.

"The evidence accumulated in the past 20 years to support community water fluoridation is overwhelming in comparison to the amount of clinical data to support the usefulness of fluoride dentifrices," the statement continued. "It would be a disservice to the dental health of the public if the promotion of fluoride dentifrices should lead to the misconception that their use is an adequate substitute for the controlled fluoridation of municipal water supplies."

The text of the Association's statement follows:

"Crest with Fluoristan" is one of the fluoride tooth pastes now being marketed throughout the United States on a regional or national basis. Crest is said to contain stannous fluoride. The American Dental Association is not aware of evidence adequate to demonstrate the claimed dental caries prophylactic value of Crest. Although clinical tests of the dentifrice are in progress, adequate information concerning its value may not be available for a year or more.

Published evidence to support the usefulness of adding of a fluoride in other dentifrices is even less convincing. The Association therefore believes that all fluoride dentifrices are being marketed prematurely. There is no assurance of the usefulness of these preparations until further clinical tests are completed and evaluated.

No evidence is available to the Association to show that a fluoride dentifrice is of any value for an individual who, during early childhood, routinely drank water containing fluoride at the optimum level. It is therefore desirable to avoid any encouragement of the indiscriminate distribution of fluoride dentifrices in areas where the water supply contains one part per million of fluoride ion or more. Use of these dentifrices for whatever topical benefit they can provide may not be objectionable in adults who received inadequate fluoride in drinking water during the years that the teeth were developing.

About 1 mg. of fluoride ion is provided by the dentifrice at each brushing procedure. It is expected that nearly all of this fluoride will be discharged by rinsing the residual dentifrice from the mouth. Small children, however, might swallow an appreciable portion of the dentifrice thus contributing to the possibility of dental fluorosis, especially where adequate or excessive levels of fluoride are present in the drinking water. Since the crowns of permanent teeth are largely calcified by the age of six, the period before this age is one of greater susceptibility to dental fluorosis, that is, mottling of the enamel from excessive ingestion of fluoride. Present labels of fluoride dentifrices therefore are required to carry a statement cautioning against the use of these dentifrices by children under six.

No fluoride dentifrice is a substitute for public health programs using fluorides. In view of the uncertain value of fluoride dentifrices it is suggested that public health or office programs for topical application of fluoride solutions be continued under appropriate conditions. When drinking water with the proper level of fluoride is provided from infancy, the developing teeth acquire a resistance to decay which extends into adult life. The evidence accumulated in the past 20 years to support community water fluoridation is overwhelming in comparison to the amount of clinical data to support the usefulness of fluoride dentifrices. It would be a disservice to the dental health of the public if the promotion of fluoride dentifrices should lead to the misconception that their use is an adequate substitute for the controlled fluoridation of municipal water supplies.

## MEMBERS REMINDED THAT MARCH 31 IS DUES DEADLINE

Any dentist who is not a member in good standing of the American Dental Association on March 31 loses his right to participate in the group insurance programs of the Association, Association members were reminded this month. In the event of reinstatement of membership in the Association, evidence of insurability is required, states Paul Zillmann, secretary of the Council on Insurance.

Past or present medical history would disqualify such a member from participation in either the group life insurance or

group health and accident insurance programs until such time as an open enrollment was held, Dr. Zillmann says. It is essential, therefore, that dues be paid to the local society secretary as soon as possible, the Council secretary says.

### RUSSIAN DENTAL MAGAZINE TO BE CULLED FOR ABSTRACTS

A Russian dental magazine has just been received by the American Dental Association for use as a possible source of material for DENTAL ABSTRACTS. Receipt of the publication, the first to be received from behind the iron curtain, makes possible the reporting of dental research and dental conditions formerly not available to the profession in America. More than 280 publications are now surveyed by DENTAL ABSTRACTS. The new Association periodical, which made its debut in January, now has over 8,500 subscribers. Of these, about 7,990 are from the United States; 610 from abroad.

### INTRAMURAL PRACTICE PLANS DEBATED BY EDUCATORS

A panel of dental educators last month unanimously agreed that a serious problem exists in the recruitment of competent teachers when salaries are below the earnings possible in private practice. They disagreed on the best solutions to the problem.

Speaking on "Intramural Practice Plans for Dental Schools" at the Twelfth Congress on Dental Education and Licensure February 4 at the Conrad Hilton Hotel were:

James T. Ginn, dean of the College of Dentistry, University of Tennessee; John C. Brauer, dean of the School of Dentistry, University of North Carolina; Donald C. Conzett, M.D., University of Iowa hospital; William H. Crawford, dean of the School of Dentistry, University of Minnesota, and J. Ben Robinson, dean of the School of Dentistry, West Virginia University. Gerald D. Timmons, chairman of the Association's Council, served as moderator.

The intramural practice plan, under which a teacher may supplement his earnings through a limited practice in facilities provided by the school and under school supervision, was defended not only as a method of supplementing earnings but as a way of improving teacher morale and effectiveness.

"It is a common experience to hear students express the attitude that a full-time teacher can tell them how to perform an operation in a skillful manner but he cannot do it himself," stated Dean Ginn, in discussing the intramural practice plan at the University of Tennessee. "Through the 'intramural practice' plan, the individual can maintain his reputation as a competent dentist so that he may command the respect of his staff and the admiration of his students."

The success of an intramural practice plan requires careful scheduling of teaching and practice hours, stated Dean Brauer. The plan at the University of North Carolina has proved effective, he stated, because it is a well-defined plan, setting forth the number of hours a teacher may spend in practice, the income which may be earned, reports to be filed and patients who may be accepted.

Intramural practice plans create a situation in which the dental school is expected to "live by the sweat of its brow," asserted Dean Robinson. He urged the educators to demand that state legislators and school trustees provide budgets which make teaching possible as a full-time career.

"Clinical practice has become too commercial," he said. "Teacher usefulness is reduced by outside practice." Dean Robinson cited student-teacher ratios, which he said, demonstrate the shortage of full-time teachers. "How can we avoid further reduction in efficiency if we allow practice in addition to teaching?" he asked.

An afternoon panel, "Selection and Use of Basic Science Examinations by Licensure Boards," was participated in by Lawrence J. Dunn, member of the New York State Board of Dental Examiners; Walter A. Wilson, dean of the Dental School, Fairleigh Dickinson College; Frank O. Alford, member of the American Dental Association's Council of the National Board of Dental Examiners, and George W. Teuscher, dean of the Dental School, Northwestern University. Moderator for the afternoon was Carl A. Laughlin, vice-chairman of the American Dental Association's Council on Dental Education.

## TRENDLEY DEAN TO HEAD AAAS DENTISTRY SECTION

H. Trendley Dean, secretary of the American Dental Association's Council on Dental Research, has been re-elected chairman of the dentistry section of the American Association for the Advancement of Science. Dr. Dean's selection was announced recently by the AAAS Council, governing body of the organization. As head of the dentistry section, Dr. Dean becomes a vice-president of the AAAS.

A second prominent dental researcher, George C. Paffenbarger, will serve as an alternate on an AAAS committee which is to select members of the nominating committee. Dr. Paffenbarger is senior research associate of the American Dental Association at the National Bureau of Standards.

The Council reports that a resolution stating that the AAAS will not meet in any location in which racial segregation is observed was approved in a mail ballot. A second resolution approved by the Council sets up an interim committee on the social aspects of science. The purpose of the committee is to examine the sociological problems created by science and to recommend action for the Council. The resolution was proposed by Ward Pigman, Ph.D., a member of the faculty of the University of Alabama School of Dentistry.

## CORRECTION OF ARTICLE ON INSURANCE AND INCOME TAX

An article in last month's JOURNAL concerning the deductibility of insurance premiums from gross income in figuring income tax was overly optimistic. The income tax ruling is that premiums for certain types of disability insurance that can be classified as "business interruption insurance" may be deductible. Health and accident insurance has not been classified as "business interruption insurance."

M.D. El Tannir, a leader in Egyptian dentistry (second from left), visited the Association recently. Dr. Tannir, who is the dentist member of Egypt's health committee for the Council on Welfare, is engaged in postgraduate study at the School of Dentistry, Indiana University. With him in the photograph are three Association Council secretaries (l. to r.): H. Trendley Dean, Council on Dental Research; Rudolph Friedrich, Council on Dental Health, and Shailer Peterson, Council on Dental Education.

CORRECTION

John I. Markey of Seattle was erroneously listed in the February obituary section of THE JOURNAL. This publication offers its sincere apologies to Dr. Markey.

SUBSCRIPTS • The Board of Trustees will meet at Association headquarters in Chicago April 2 and 3. . . . The workshop on the training of dental laboratory technicians, sponsored by the Council on Dental Education and the Council on Dental Trade and Laboratory Relations will be held in Chicago's Morrison Hotel March 5-7. . . . Two films available from the Film Library, previously cleared for television have had clearance withdrawn. They are *Target: Tooth Decay* and *Teeth Are To Keep*. Both may be rented for nonTV showing from the Film Library at the Central Office.

## Dental Societies

### KENTUCKY LEGISLATURE KILLS "PRACTICAL DENTISTS" BILL

A bill proposing the creation of "practical dentists" has been killed in committee by the Kentucky House of Representatives, reports Alvin B. Coxwell, Jr., secretary of the Kentucky State Dental Association. The bill would have permitted unlicensed persons to practice certain types of dentistry in rural areas. The dental society testified against the measure as being a threat to dental health.

### BOOST CHILDREN'S DENTAL HEALTH IN WEEK-LONG EVENT

Better dental health for children was given a boost by the 1956 celebration of National Children's Dental Health Week February 5-11. Dental societies across the country sponsored events along with teacher groups, PTA's and community organizations to focus attention on the importance of healthy mouths in the nation's children.

National circulation magazines such as the *Ladies Home Journal* and *Parents Magazine* publicized the event. Hank Ketcham, creator of the famous "Dennis the Menace" cartoon character, did a special "Dennis" drawing. Newspaper, radio and TV coverage was widespread.

Among events sponsored by dental societies was a "Smile of the Year" contest carried out statewide by the Oklahoma State Dental Association. During the contest dentists checked the teeth of more than 50,000 junior high school children. Some 100,000 flyers were attached to milk bottles by the dairy industry of Oklahoma to publicize the contest. A special dinner for the 14 boy and girl finalists was given by the state dental society at which time two winners were chosen.

Trophies and gold wrist watches were awarded the winners by D. L. Rippeto, state society president. Contest co-chairmen were Earl Cunningham and Dean Robertson of Oklahoma City.

In New York in a City Hall ceremony, Mayor Robert F. Wagner awarded banners to students from two schools in the city which achieved a 100 per cent dental health record. Chairman of the Dental Health Week Committee was Sanford N. Kingsly of Brooklyn.

Among TV programs was that of the Maryland State Dental Association. The state group hired a public relations man to assist it. Through his efforts, "Romper Room," a 32 station network, carried three dental health programs during the week. One of them demonstrated correct toothbrushing methods.

Children's Dental Health Week was celebrated throughout the nation February 5-11. In Oklahoma a state-wide smile contest was widely publicized. It culminated in a dinner for boy and girl finalists (top photograph). Statewide winners were 12 year old Tom Tucker (seated, left) and Sue Givens, also 12 (inset).

In New York (bottom photograph) awards went to students from schools achieving 100 per cent dental health. New York's Mayor Wagner (standing, left) presented the awards to Lynn Frazee (left), student at P.S. 116, Manhattan, and Jay Raddock, student at Yeshiva of Flatbush, Brooklyn. Carla Meisel of Brooklyn (right) was chosen Little Miss Dental Health of 1956. Sanford N. Kingsly of Brooklyn, chairman of the Dental Health Week Committee of New York's dental societies, holds the Mayor's proclamation of the week-long health event.

### PROPOSE NONPROFIT DENTAL GROUP HANDLE STATE PROGRAM

Administration by the dental profession of the dental health care program for welfare recipients in the state of Washington was recommended recently by W. A. Moline of Spokane, president of the Washington State Dental Association. He proposed that administration of the dental program be turned over to the dental profession's Washington State Dental Service Corporation, headed by Elmo Beeson of Seattle. The Corporation is a nonprofit organization administering group programs for unions and others.

Such a change, Dr. Moline said, would save money for the state and would provide better dental care for welfare recipients. The corporation would maintain central records on dental treatment given, a practice not followed at present. Rather than have an indigent patient's needs screened by one dentist and treated by another, one dentist would do both. Screening of 5 per cent of the patients, chosen at random, would serve to check on the quality of treatment rendered. After establishing eligibility for treatment as is required now, an indigent person would select a dentist of his own choice from among the dentists participating in the program.

### HANDLE UNION REQUESTS AT STATE LEVEL, SOCIETIES SAY

Union requests for consideration of a dental program are best handled at a state society level. This point of view has been adopted by three of the dental societies comprising the Joint Committee on Dental Health Care. They are the New Jersey, New York and Pennsylvania societies.

The societies stated that "experience in other localities has shown that negotiations by individuals or small groups of a state society have almost invariably resulted in delay, confusion and in some instances even the institution of unsound programs."

Where a union plan is not confined to the borders of a single state, the union's request is to be referred to the Joint Committee.

### OUTSTANDING DENTAL LEADERS TO HONOR B. C. KINGSBURY

Outstanding dental leaders all over the United States have been invited to an April 22 dinner in honor of Bernerd C. Kingsbury, president of the American Dental Association. The dinner for Dr. Kingsbury is sponsored by the California State Dental Association, of which he has been an active member for many years. Dr. Kingsbury is a former president of the state group. The affair is scheduled for the Fairmont Hotel in San Francisco.

The arrangements committee includes William S. Smith, president of the California society; G. Thomas Quigg; T. Galt Atwood, and Francis J. Herz.

### 14,500 ATTEND CHICAGO MIDWINTER MEETING

The latest developments in dentistry from ultrasonic speeds in cavity preparations to the description of a new machine to locate areas of muscular pain were presented to more than 14,500 dentists from throughout the United States who attended the 91st Midwinter Meeting of the Chicago Dental Society in the Conrad Hilton Hotel in Chicago, February 5-8.

The hotel's grand ballroom was filled to capacity for the closed circuit color television broadcasts of laboratory demonstrations in oral surgery, anesthesia, periodontics, diagnosis and basic principles of occlusion.

Some 234 essayists and clinicians participated in the four day meeting, which was handled by 330 committee members and chairmen under the direction of the

Society's president, Gustav W. Solfronk, Herman R. Wenger, its general chairman, and Adolph F. Stark, program chairman.

Winners of the 15th annual $500 research award were J. Georges Perreault of the University of Montreal, and Maury Massler and Isaac Schour of the University of Illinois. Dr. Massler read the prize winning essay entitled "Reaction of Odontoblasts to Medicaments Placed in Cavity Preparations in Rat Incisors."

Bernerd C. Kingsbury of San Francisco, president of the American Dental Association, told the opening session of the financial crisis facing the nation's dental schools and the need for assistance from industry, labor, foundations and government.

### MEDICAL PROGRESS AND DENTISTRY—MEETING THEME

Medical progress and dentistry is the theme of a March 14 and 15 meeting to be held in Cleveland under the sponsorship of the Cleveland Dental Society and the Frank E. Bunts Educational Institute. A wide variety of topics have been announced, including otolaryngological problems in dentistry, dentistry for paraplegics, clinical effects of parathyroid disease, dermatological lesions of the face and problems faced by the dentist himself—hypertension, eye strain and orthopedic difficulties. These subjects will be presented in a series of short papers.

Among the guest speakers are W. D. Armstrong, M.D., head of the department of physiological chemistry, University of Minnesota Medical School; T. J. Hill, professor emeritus, oral pathology, Western Reserve University School of Dentistry; D. R. Kinsley, president of the Cleveland Dental Society, and A. H. Kniesner, assistant professor of pathology and periodontics, Western Reserve School of Dentistry.

Advance registration may be made by writing to the Frank E. Bunts Educational Institute, 2020 E. 93 St., Cleveland 6.

### MICHIGAN CENTENNIAL PLANS NEAR COMPLETION

Plans to celebrate the 100th anniversary of the founding of the Michigan State Dental Association are nearing completion. The centennial will be observed April 15-19 at the Hotel Statler in Detroit.

More than 75 scientific presentations are planned. There will be 13 panel discussions or group presentations. Several historical exhibits, including one comparing today's dental office with that of 100 years ago, will be shown. Social events include a centennial luncheon, banquet and a dramatic presentation on the development of dentistry in Michigan.

High lights of the scientific program are presentations by the Genessee County (Michigan) Dental Study Club on mouth rehabilitation; practical methods for correcting thumbsucking by Hans Freudenthal of São Paulo, Brazil; psychosomatic dentistry by the Michigan Society of Psychosomatic Dentistry, and frontiers in research by Thomas J. Hill of Cleveland.

## Dental Education

### EXPAND RESEARCH AND CLINIC FACILITIES AT NORTHWESTERN

A major expansion of clinic and research facilities at the Northwestern University Dental School has been announced by Dean George W. Teuscher. Under construction are two new clinics, one designed especially for treatment of handicapped children. A third clinic is completed. Extensive remodeling of two research laboratories also is being undertaken.

Scheduled for completion in March are an oral surgery clinic and a clinic for diagnosis, treatment planning and research. Remodeling of physiology and pathology research laboratories will take about six months. An orthodontics clinic is finished.

The oral surgery clinic, designed for treating handicapped children such as those with cerebral palsy, heart disease or mental retardation, will have all the facilities of a modern hospital. Orion H. Stuteville, chairman of the department of oral surgery, will direct the clinic. Staff additions are planned.

The diagnosis, treatment planning and research clinic will occupy 2,500 square feet of floor space. The director is Arthur Elfenbaum, chairman of the department of diagnosis.

Principal expansion of research in the physiology research laboratory will be on the electrical activity of the muscles of the jaw and in the evaluation of local anesthetics.

## ERNEST JONES, WASHINGTON'S FIRST DENTAL DEAN, DIES

Ernest M. Jones, first dean of the University of Washington School of Dentistry in Seattle, died of a heart attack February 8. He was 64 years old. Dr. Jones, who joined the University in 1945 and helped plan the school and the Health Sciences Building, had retired as active dean in December 1954, because of ill health. Since that time he served as a consultant to the dental school but had no active teaching duties.

Dr. Jones was honored for his contributions to dental education in 1952 when the University of Southern California School of Dentistry awarded him a bronze plaque.

The dean received his professional training at the Northwestern University College of Dentistry and taught at the Southern California dental school prior to assuming his deanship in Washington.

Dr. Jones was a Fellow of the American College of Dentists, a member of the American Association for the Advancement of Science and the American Academy of Restorative Dentistry. He is survived by his wife, two daughters and five grandchildren.

Ernest Jones

## X-RAY EQUIPMENT ADAPTED TO STUDY OF CLEFT PALATE

A stereocephalostat, which permits the taking of three-dimensional pictures to show the relation of bone and tissues to each other, has been installed at the Cleft Lip and Palate Institute of Northwestern University Dental School. The school believes that it is the first time such equipment has been adapted to the study of problems of cleft palate.

The machine's source of radiation is a new high-speed x-ray unit with a small rotating anode that gives fine detail and images of delicate bony structure. The positioning device was designed by T. M. Graber, associate professor of orthodontics and director of research at the Institute. Pictures may be taken of patients of any age from birth to adulthood.

It is possible to take lateral, frontal and vertical pictures at oriented angulations as small as one degree. Installation of the stereocephalostat was made possible by a gift of over $3,000 from the Rogers Park Kiwanis Club.

## ILLINOIS BEGINS INTERSTATE CLOSED CIRCUIT TV TEACHING

Periodontics will be the first dental postgraduate course ever to be presented over an interstate closed circuit television network. A University of Illinois College of Dentistry course, four weekly sessions beginning March 5, will be telecast live to cities in six states. The cities are Chicago, Cleveland, Indianapolis, Milwaukee, Minneapolis and St. Louis. Fourteen prominent educators will teach. Reference material and information to supplement the demonstrations will be sent to participants. Location of classrooms may be obtained from the college in Chicago.

## MORE THAN 200 ASSISTANTS ENROLL FOR CAROLINA COURSE

More than 200 dental assistants throughout the country have enrolled in the dental assistants' correspondence course conducted by the University Extension Division of the University of North Carolina, according to a recent announcement issued by John C. Brauer, dean of the School of Dentistry.

The course is designed to meet the minimum educational requirements of the American Dental Assistants Association. It has been planned to be of use to both the employed dental assistant and to the person interested in beginning such a career. Information on the program may be obtained from the School of Dentistry in Chapel Hill.

## SCHOOLS ANNOUNCE GRADUATE AND POSTGRADUATE COURSES

*Alabama* • Surgical anatomy of the head and neck and etiology and diagnosis of pain of dental origin will be taught by Harry Sicher at the University of Alabama School of Dentistry in Birmingham. Dr. Sicher's anatomy course is scheduled for May 7-9. The course on dental pain will be presented May 10 and 11.

*Eastman* • The Eastman Dental Dispensary in Rochester, N. Y., offers a postgraduate course in orthodontics. The course, which begins in September, will be 18 months to two years in duration. Candidates for an advanced degree must enroll in the two year program; supplementary courses will be given at the University of Rochester, School of Medicine and Dentistry.

*Pennsylvania* • The Graduate School of Medicine of the University of Pennsylvania and the Riesman Dental Clinic, Beth Israel Hospital, in Boston, announce a 20 month graduate training program in periodontology under the direction of Prof. Henry M. Goldman. One year is spent at the School of Medicine in Philadelphia; emphasis is placed on the sciences basic to dentistry and clinical periodontology. The second year, at the hospital, is devoted to practice and to research.

The School of Dentistry has listed three postgraduate courses for the coming months. H. Milton Rode will teach complete denture prosthesis June 18-23; Joseph E. Johnson, the twin wire mechanism, June 4-8, and Louis I. Grossman, endodontics teachers' course, September 10-12.

*Pittsburgh* • Selection of students for graduate classes in oral surgery, orthodontics, pedodontics, periodontics, prosthodontics and anesthesia will be made in March by the University of Pittsburgh School of Dentistry. Applicants for the postgraduate full-time 12 month course in general anesthesia for oral surgery will be considered at the same time.

*Temple* • A four day participating course in occlusion is offered May 3-6 by Temple University School of Dentistry in Philadelphia. The course is limited to 20 members and is under the direction of Bernard Jankelson of Seattle.

*Washington* • Practical root canal therapy will be taught March 18-21 at the University of Washington School of Dentistry in Seattle. Also scheduled for March is a course in cancer of the oral region, March 20 and 21. Both are refresher courses. The cancer course is being taught in cooperation with the American Cancer Society. The faculty is Berton E. Anderson, Thomas B. Carlile, M.D., Paul E. Boyle, B. O. A. Thomas, Frank H. Wanamaker, Paul Lund, M.D., Kenneth Knudtzon, John D. Gehrig and Simeon T. Cantril.

In addition, the school offers a refresher course in oral roentgenology April 3 and 4.

Harrison M. Berry, Jr., will teach. Also scheduled for April is a refresher course entitled "The Fabrication of Functional Esthetic Dentures." Dates for this class are April 26-28.

SUBSCRIPTS • Columbia University has named the dental school museum the Charles H. Land Museum in memory of Dr. Land, the originator of the porcelain jacket crown. General Lindbergh, his grandson, has financed the preparation of an annotated catalogue of the historical collection. . . . Jacob Oxman, former supervisor of development at the New York University-Bellevue Medical Center, has been named assistant to the dean for development at NYU's College of Dentistry.

## National Defense

### ARMED FORCES INSTITUTE ANNOUNCES PATHOLOGY COURSE

The dental and oral pathology branch of the Armed Forces Institute of Pathology will present its third annual course in pathology of the oral regions March 26-30 at the Armed Forces Institute in Washington, D. C. Col. Joseph L. Bernier, (DC) USA, is director of the course. Subjects under discussion are physiology of bone, tumors of the soft tissues and the use of radioactive isotopes in dental research.

### SIXTEEN DENTISTS APPOINTED TO USPHS RESERVE CORPS

Sixteen dentists are among 124 members of the health professions appointed in February to the U.S. Public Health Service's Commissioned Reserve. It was the second group of appointments in recent months.

Officers of the Commissioned Reserve will be called on in emergencies such as devastation of cities, extensive illness and death from disease outbreaks or disruption of community life caused by hurricanes, floods or earthquakes. Dentists receiving commissions are:

Robert W. Rule and Wendell L. Wylie of California; Harold W. Oppice of Illinois; Roscoe M. Justice of Kentucky; Norman P. Chanaud and Stanley J. Meadows of Maryland; Alfred E. Seyler of Michigan; Barton E. Perrizo of Minnesota; Robert E. Marshall, Charles R. Shale and Luther O. Wicecarver of Missouri; Robert M. Wood of South Dakota; Carl B. Holmes and Robert L. Weiss of Tennessee; Paul M. Green of Texas, and Robert H. Davis of West Virginia.

### MAXILLARY AND MANDIBULAR BONE IS CONFERENCE TOPIC

Maxillary and mandibular bone will be the topic of the fifth annual conference of the Second District Dental Society and the Brooklyn Veterans Administration Hospital. The conference is May 4 at the hospital.

Nine essayists have been announced. They are: Alexander W. Kruger, M.D., manager of the hospital; Gerrit Bevelander, Ph.D., department of histology, College of Dentistry, New York University; Philip Person, chief of dental research at Brooklyn VA Hospital; Lester R. Cahn, associate professor of oral pathology, Columbia University; S. Sigmund Stahl, assistant professor of periodontology, New York University; Maurice J. Hickey, M.D., dean, School of Dental and Oral Surgery, Columbia University; William F. Harrigan, M.D., head of the department of oral surgery, New York University; Theodor Blum, consultant in oral surgery, the New York Institute of Clinical Oral Pathology and Brooklyn VA Hospital, and Saul Schluger, associate clinical professor, Columbia University.

Chairmen of the sessions are Abraham M. Kleinman, M.D., director of profes-

sional services, Brooklyn VA Hospital, and William Hyde, president of the Second District Dental Society.

### SIXTEEN DENTISTS COMPLETE CIVIL DEFENSE COURSE

Sixteen dentists recently completed 24 weeks of study in civil defense. They are members of the Panama Canal Zone Dental Society and of the Armed Forces stationed in the Canal Zone. The course, under the direction of Capt. Charles J. Schork, (DC) USN, was designed to prepare dentists for an important role in event of an emergency. Those receiving certificates after completion of training were: Belisario del Rio; Adalberto Muller; Lieut. Robert R. Pettit, (DC) USA; Maj. William O. Dougherty, (DC) USA; Lieut. Jack Slotoroff, (DC) USA; Col. Kenneth C. DeGon, (DC) USA; Carlos S. Anguizola; Alfredo H. Berguido; Mauricio J. Mares; Juan R. Morales; Agustin Arango; Juan B. Arias; Lieut. Frederick G. Choisser, (DC) USN; Lieut. John J. Dunne, (DC) USAF; Ernesto Calvo, and Col. John R. Eastman, (DC) USAF.

SUBSCRIPTS • All Army physicians and dentists in the grade of first lieutenant who have at least one year of professional experience will be advanced to the temporary grade by the end of March, according to a February 7 announcement by Maj. Gen. Silas B. Hays, the Army surgeon general. . . . Maj. Gen. Oscar P. Snyder, chief of the Army Dental Corps, was recently made an honorary member of the Ancient Order of Saint Barbara by Army artillerymen. Saint Barbara was chosen as the artillerymen's patron saint to ward off casualties. . . . March 3 was the 45th anniversary of the Army Dental Corps. Present strength of the Corps is 2,200 officers stationed in more than 200 dental clinics in this country and overseas.

## Public Health

### TOLEDO FLUORIDATION SERVES 435,000 IN CITY AREA

Fluoridation of the water supply at Toledo, home town of Charles T. Betts, one of the leading opponents of the caries-preventive measure, was announced in January. The project started operation December 30 and serves 435,000 persons in the city and surrounding areas, according to Louis G. Hill, president of the Toledo Dental Society.

Efforts of the Toledo Dental Society and the Junior Chamber of Commerce were credited for adoption of the program which had been approved by the city council last March. The society has started a five year checkup plan of school children, Dr. Hill said.

With the addition of Toledo, there were 1,139 communities with a population of 22,708,756 drinking fluoridated water. On the legal front, the trial court in Fargo, N. D., issued a ruling favorable to the health measure. This decision makes North Dakota the tenth state to uphold the legality of fluoridation.

A report on the ten year caries fluorine study at Sheboygan, Wis., shows that the total reduction in decay in deciduous teeth was 60.4 per cent. City dental director A. H. Finke pointed out that the results in Sheboygan compared closely to those of Newburgh, N. Y., whose ten year report was issued recently.

Fluoridation of water supplies in the nine town area served by the metropolitan district of Hartford, Conn., has been endorsed unanimously by community health directors and by 273 of 291 dentists polled in the district.

Mr. William H. Bulkeley, chairman of the Greater Hartford Committee for fluoridation, stated that although no attempt was made to solicit anything other than "for," "against" or "undecided", many of the dentists added statements strongly backing the health measure.

## International

### U.S. DENTISTS TO TAKE PART IN INTERNATIONAL CONGRESS

Dentists from the United States will be participants in the International Dental Congress of the Fédération Dentaire Internationale scheduled for Rome, Italy, September 1957, according to Obed H. Moen, U.S. national treasurer of the F.D.I.

"The international meeting, held every five years, is one of the big events in world dentistry," states Dr. Moen. "It is attended by dentists from practically every country in the world. Because of the 1957 Congress and the 1956 meeting, May 28 to June 3, in Zurich, the next two years will be of extreme interest to dentists in the United States," Dr. Moen says. Participation in the affairs of world dentistry can be achieved through membership in the F.D.I. The Fédération provides its members with the quarterly *International Dental Journal*, the F.D.I. *News Letter*, membership card and reduced enrollment fees at meetings. Further information may be obtained from Dr. Moen, 6 Main St., Watertown, Wis.

### GERMAN ASSOCIATION EVALUATES DENTAL DRUGS

A German publication similar to the American Dental Association's *Accepted Dental Remedies* has been prepared by the 30,000-member German Dental Association. Entitled *Informationen über Zahnärztliche Arzneimittel*, the book describes therapeutic items of demonstrated usefulness in dental practice. It is the first such publication to appear in Germany.

SUBSCRIPTS • J. Ll. Saunders, director of New Zealand's division of dental hygiene, retired in mid-January. Dr. Saunders served with the division for 31 years. He is succeeded by J. B. Bibby. . . . Immanuel Ottesen, a member of the List of Honour of the Fédération Dentaire International, died December 8 at the age of 81. Dr. Ottesen was president of the Norwegian Dental Association and of the Scandinavian Dental Association. For six years he served as dean of the Norwegian Dental School. . . . The Segundas Jornadas (dental week) of the Federación Odontológica Argentina will be May 27-30.

## General

### JOHN WALLACE TO LECTURE AT HILLSIDE HOSPITAL

John R. Wallace of Winchester, Mass., will lecture on principles and problems of prosthetic practice at Hillside Hospital in Glen Oaks, N. Y., March 19. Dr. Wallace will give the first annual memorial lecture in honor of Barnett Kessler, founder and former director of the hospital's dental department. Dr. Wallace is a past president of the American Denture Society.

### EASTER SEAL CAMPAIGN AIDS CRIPPLED CHILDREN

Easter Seals will go into more than 33 million American homes during the 1956 Easter Seal campaign, estimates the National Society for Crippled Children and Adults. The annual nationwide appeal opens March 10 and continues for a month.

Easter Seals finance hundreds of direct services to crippled children and adults in the United States. New medical discoveries and technics have made possible tremendous advances in the rehabilitation of the crippled, the Society states, so that a great many children can be helped to a normal life. Dentists have been asked to contribute generously to the 1956 campaign.

### VICTOR SEARS HONORED BY PLASTICS RESEARCH ACADEMY

Victor H. Sears of Salt Lake City has been given the annual award of the American Academy for Plastics Research in Dentistry. Dr. Sears was honored for his work in determining the wearing qualities of porcelain as compared to plastic teeth in dentures. The trophy was presented to Dr. Sears by Gustav Solfronk at the Academy's February meeting in Chicago.

### HEALTH SCIENCES HELP MARK BEN FRANKLIN'S BIRTHDAY

The year 1956 marks the 250th anniversary of Benjamin Franklin, American philosopher and statesman of the 18th century, whose accomplishments in many fields are legion. The health sciences will take part in the international celebration which is being sponsored by the Franklin Institute in Philadelphia.

Benjamin Franklin helped found America's first public hospital. He vigorously championed the idea that the public has a responsibility in the aiding of medical research. He invented a flexible catheter, bifocal spectacles and a machine for showing circulation of the blood. Franklin initiated research into lead poisoning and led a crusade for inoculation against small pox. Various hospitals and medical groups are planning exhibits, papers and special events in his honor.

### ENDODONTISTS ELECT JOHN PEAR PRESIDENT

John R. Pear of Grosse Pointe, Mich., was elected president of the American Association of Endodontists at the Association's annual meeting February 4 and 5 in Chicago. Chosen for the post of president-elect was George C. Hare of Toronto, Canada. George G. Stewart of Philadelphia is vice-president; V. B. Milas of Chicago is secretary; Paul P. Sherwood of Cleveland, treasurer, and Victor H. Dietz of St. Louis was chosen for the post of editor.

*Also* • A large display on dental health is among items being shipped to Nigeria from the Cleveland Health Museum. The dental display will appear in Nigeria's national health week this spring. . . . Dental health tips for children will be carried in a full-page comic strip to be carried in more than 10 million magazines distributed by National Comics Publications in the next two months. The strip is published as a public service in cooperation with the National Social Welfare Assembly. . . . The American Society for the Advancement of General Anesthesia in Dentistry announces that its meeting date has been changed to March 19 at the Hotel Shelburne in New York. . . . Other meetings announced for the coming months are the April 29 to May 3 meeting of the American Association of Orthodontists and the Medical Library Association annual meeting June 18-22. The librarians meet in Los Angeles, the orthodontists in Boston. Attendance at the Boston meeting is limited to those certified by the credentials committee, whose chairman is Abijah Pierce, 58 Federal St., Greenfield, Mass. . . . Temple University Dental Alumni Day is May 2. The scientific session will be at the school and the evening banquet at the Drake Hotel in Boston.

# *Current Literature*

## IMMEDIATE MAXILLARY DENTURE IMPRESSION

*Ralph C. Appleby, D.D.S., M.S., and Wayne F. Kirchoff, D.D.S., M.S. J. Pros. Den. 5:443 July 1955.*

More and more people are becoming aware of immediate denture service. The value of immediate denture service is unquestionable. An immediate denture impression must fulfill certain fundamental principles. These principles may be summarized as follows: As much denture-bearing region must be covered as is possible within normal functional limits. A border should be developed within the limits of tissue tolerance. The border must harmonize with anatomic and physiologic landmarks surrounding the denture. Impression materials must be adapted accurately to underlying tissues without injurious displacement.

To fulfill these principles, a stock tray is used to take an alginate impression from the maxillary arch, and a preliminary cast is made.

An individual tray is constructed for use in making the final impression. An outline 3 to 4 mm. short of the mucobuccal fold and coinciding with the vibrating line approximately at the beginning of the soft palate is penciled on the preliminary cast. Shredded wet asbestos is adapted around the teeth. One thickness of baseplate wax is adapted over the asbestos and cast and terminated at the pencil line.

The purpose of the wax spacer and asbestos shim is to provide space for the alginate material used for making the final impression. A rapid curing resin tray is constructed over the wax spacer. The cured tray is removed from the preliminary cast. The wax spacer will adhere to the tray. The wet asbestos is removed, and the tray is trimmed to the borders of the wax spacer. The wax spacer remains in the tray, and the tray is placed in the patient's mouth. The borders of the tray must be 3 to 4 mm. short of the mucobuccal fold. The posterior border is trimmed so that it terminates just anterior to the movable portion of the soft palate.

The wax spacer is removed except for three "stops." These stops are located so that there is one on the crest of the ridge just anterior to each maxillary tuberosity and one in the midpalatal region just posterior to the remaining teeth. The position of these stops may be changed to suit mouth conditions.

Low-fusing stick modeling compound is traced on the borders of the tray and muscle-trimmed, section by section. The impression compound is purposely trimmed approximately 1 mm. short of the mucobuccal fold.

Approximately 25 holes are made in the tray with a no. 8 or 9 round bur in order to ensure adherence of the alginate impression material to the tray. A piece of string or dental floss is threaded through several of the perforations to facilitate removal of the tray after the impression is made. The final impression is made with an aliginate impression material.

The patient now rinses his mouth with water containing a few drops of aromatic spirits of ammonia. The alginate is mixed, placed in the tray, smoothed and inserted in the patient's mouth. The labial and buccal frenulums are freed, and the patient's facial muscles should be completely relaxed.

After the alginate has completely set, it is removed from the mouth, and the cast is poured. A post-dam is placed in the final cast to the depth of approximately half the depth that the mouth tissue is displaceable.

*Joe P. Lambert*

## MOVEMENTS OF THE TEMPOROMANDIBULAR JOINTS AND THEIR RELATION TO THE PROBLEMS OF OCCLUSION

*Henry A. Collett, J. Pros. Den. 5:486 July 1955.*

Temporomandibular joint movement is but one of the factors in the study of occlusion. Consideration must be given also to the prominence of the compensating curve, cusp height, the inclination of the incisal guidance, inclination and orientation of the occlusal plane.

The study of occlusion must be made from two aspects: the dynamic or functional occlusion and the static occlusion.

To understand the movements of the temporomandibular joint, it is necessary to have a basic knowledge of its anatomy and physiology.

Those who believe in the existence of the hinge axis can use it as an aid in diagnosis of problems in occlusal dynamics. By proper employment of the hinge axis face-bow to transfer measurements to a fully adjustable articulator, many occlusal interference problems can be overcome. It is also believed that the hinge axis face-bow will give a more accurate

transfer and orientation of the casts to the articulator than will the empirical face-bow.

This study shows that both the dynamic and static aspects of temporomandibular joint movement must be studied, that transfer to a good articulator of the axis records is of great value and that improper positioning of the casts on the articulator can be detrimental to good results. In addition, the study demonstrates that the Bennett movement has an effect on cuspal interdigitation in lateral movement, that a good, fully adjustable articulator must be employed to obtain these results and that the use of monoplane teeth compensates for many of the inaccuracies over which there is no control.

*W. H. Meyer*

## A CONSIDERATION OF SOME OF THE MAIN FACTORS CONTRIBUTING TO THE DEVELOPMENT OF MAXIMUM EFFICIENCY AND TO THE PROLONGATION OF THE SERVICE LIFE OF COMPLETE IMMEDIATE DENTURES

*Rudolph O. Schlosser. J. Pros. Den. 5:452 July 1955.*

The main factors that contribute to maximum efficiency and long service of the immediate denture include the conservation of as much of the ridge as possible (this does not mean that needed surgical intervention is neglected); the perfect peripheral adaptation of the denture and the perfectly balanced occlusion built into an acceptable vertical dimension.

There are specific advantages to be gained from a careful study of the mounted study casts. Prevailing undercuts or excessive bony prominences should be studied both in the mouth and on the casts. Routinely, it is advisable to extract the bicuspids and molars from three to six weeks prior to construction of the primary impressions. The denture is constructed in the following sequence:

A modeling compound muscle-trimmed impression is made in an individual acrylic resin tray. The final impression is made with modeling compound in the edentulous regions and with alginate in the dentulous regions.

Partial baseplates and occlusal rims then are constructed in order to make the necessary records. The first of the three records to be obtained is the face-bow record. The next is the one which registers the protrusive relation of the mandible.

Posterior teeth are set up on the baseplates for try-in.

The amount of trimming that is to be done is marked on the casts. The extent of the free marginal gingiva in the mouth and the depth of the pockets about the teeth are checked by slipping one point of a pair of tweezers under the free tissue and closing the tweezers gently.

The anterior teeth are cut off from the cast on one side of the median line. The procedure is repeated on the other side after the replacement teeth have been set.

The waxing and processing of the denture are completed.

Extraction of the anterior teeth, the trimming of bony prominences, the insertion of the denture and the instructions to the patient relative to the use and care of a set of artificial teeth are the final steps.

Even the best of immediate dentures will eventually have to be replaced, but unfortunately, too many so-called immediate dentures are being made entirely too temporary. To prolong the service which the denture can render, various methods of relining or duplication are resorted to. With the advent of the quick or self-curing resins, it is possible to reline the denture in a single sitting. Whichever method is employed, it requires much less time than the making of an entirely new denture. All relining should be followed by rebalancing of the occlusion.

*Eugene H. Taylor*

## TISSUE CHANGES EFFECTING OPERATIVE PROCEDURES

*Charles F. Bodecker. J. Ohio D. A. 29:74 May 1955.*

The permeability of the dentin in various teeth of individuals of different ages is known to be widely different. This difference is related to the degree of maturity attained by the dentin of the crown, as shown by the opacity of mature "blocked" dentin. Sections through teeth having immature or mature dentin show the varying extent of caries deep to the various types of dentin. Pulpal damage produced by too rapid operative procedures without proper use of a coolant results in the formation of caries under dentin or under crown and bridge restorations. Anesthesia does not protect the patient from the harmful effects of too violent instrumentation; it affords protection only from pain during the procedure. Metal fillings should be insulated by effective cavity lining to protect the pulp from temperature changes. Thus, the destructive effect of tissue injury may be minimized, and the pulps may be kept in a healthy and normal condition.

*John A. Cameron*

# *Book Reviews*

## THE HEMORRHAGIC DISORDERS— A CLINICAL AND THERAPEUTIC APPROACH

*By Mario Stefanini, M.D., and William Dameshek, M.D. 368 pages with 147 illustrations. Index. Appendix. $11.75. New York, Grune & Stratton, 1955.*

This monograph is concerned not only with the abnormalities of coagulation but with vascular, platelet and fibrinolytic mechanisms underlying bleeding phenomena. It gives a practical approach to the various types of bleeding, including oral hemorrhage. Bleeding is discussed from its clinical, laboratory and diagnostic aspects. Prevention and therapeutic methods also are presented. The monograph is important because it discusses the entities in hemorrhagic disease that are beginning to be understood, for example, the fibrinolytic purpuras, the dysproteinic purpuras and the vascular purpuras.

The authors present the normal hemostatic mechanism. They classify hemorrhagic diseases; enumerate the thrombocytic states and hemorrhagic disorders which result from various deficiency factors, from circulating anticoagulants, fibrinolysis, protein deficiencies and from the inborn errors of metabolism. A chapter devoted to the technics used in the study of hemorrhagic disorders elucidates the testing procedures currently used to diagnose bleeding phenomena. It gives the practitioner the basis for arriving at a definite diagnosis before specific therapy is instituted.

There is an extensive bibliography limited to studies made in Boston and abroad. The study of hemorrhagic disease has been carried on in various laboratories in this country and is not limited to Boston clinics. The book is clearly written, well illustrated and easy to read.

*I. Newton Kugelmass*

## AN ATLAS OF DENTAL HISTOLOGY

*By E. B. Manley, E. B. Brain and E. A. Marsland. Second edition. 91 pages with illustrations. $4.50. Springfield, Ill., Charles C Thomas, 1955.*

This publication, produced in England at the University of Birmingham, is an excellent pictorial description of the microscopic structure of teeth and the supporting structures. It provides an adequate visual aid to the student, teacher and practitioner.

The first 65 pages include 134 photomicrographs organized under the following topics: enamel, dentin and pulp; the tissues of tooth attachment; tooth development; amelogenesis; epithelial attachment; and resorption of deciduous teeth. Each topic is preceded by a short, concisely written treatise dealing with the material presented. The photomicrographs are excellent duplications. The magnification used in making the photomicrographs is adequate, and the quality of the paper on which they are reproduced is of a nature that the fine details stand out clearly. Each photomicrograph is adequately described and clearly labeled, which makes them easy for the reader to interpret. The plates present new material.

Plate number 11, which appears on page nine and is intended to represent the distribution of an enamel lamella in longitudinal plane from a ground section of an unerupted tooth, may be questioned. It appears unconvincing; one wonders if the structure defined as lamella could possibly be normal enamel matrix which has not yet completed calcification.

The remaining 26 pages of the atlas deal with a description of histological technics utilized in the preparation of dental tissues. It contains 23 figures and completes a knowledge so important to those interested in the microanatomy of the dental tissues.

*George W. Burke, Jr.*

## DIFFERENTIAL DIAGNOSIS OF LEUKOPLAKIA, LEUKOKERATOSIS AND CANCER IN THE MOUTH

*By Ashton L. Welsh, M.D. 62 pages. $2.50. Springfield, Ill., Charles C Thomas, 1955.*

This five chapter monograph is designed to acquaint the reader with the salient features and differential diagnosis of the oral disease entities mentioned in its title. The material is organized in logical sequence, with the most benign disease presented first. A description is given of progressive changes in this disease which lead ultimately to malignancy.

The subject is timely and of significance to every practitioner dealing with oral disease. There is confusion in terminology, however, as the author vividly describes the classical picture of hyperkeratosis simplex under the heading leukoplakia. Likewise, what most oral

pathologists regard as leukoplakia is in this writing termed leukokeratosis.

The chapter on cancer briefly reviews the principal characteristics of cancer as it occurs in various parts of the oral cavity. The chapter is preceded by a short description of the principal forms of oral cancer including the histopathology of these forms.

Chapter four is entitled "Differential Diagnosis" and includes a discussion of other oral lesions which appear as pearly-smooth patches and which may be confused with leukoplakia. Diseases are included, however, which in no manner clinically resemble the diseases that are the primary subject of the text.

Although the monograph is relatively short and readable, there is a tendency towards verbosity. The wordy descriptions do not compensate for the complete lack of illustrations, and the informative value of the text is limited.

*Herbert J. Bloom*

## PRINCIPLES OF INTERNAL MEDICINE

*Edited by T. R. Harrison, Raymond D. Adams, William H. Resnik, Paul B. Beeson, George W. Thorn and M. M. Wintrobe. 1,703 pages with illustrations. Index. $16. New York, McGraw-Hill Book Co., Inc., 1954.*

This really modern book discusses disease from the current clinical and scientific concepts of internal medicine. Each systemic disorder is approached not only from the standpoint of structure and dysfunction of the organ but also from the standpoint of abnormal physiology, chemistry and psychology. Such an approach is indispensable for understanding of the development, evolution and management of any disease.

After a preliminary discussion of a proper approach to the patient, the authors formulate the functional approach to the principles of medicine. Such an approach is invaluable in medical, dental and surgical practice, for no single process or part of the body is in any way dissociated from the total organism.

Part I of the book gives the cardinal manifestations of disease; Part II, physiological considerations germane to medicine; Part III, reactions to stress; Part IV, metabolic and endocrine disorders; Part V, chemical disorders; Part VI, physical disorders, and Part VII, diseases of organic systems.

The dentist will be particularly interested in the discussions of the patient in relation to the doctor, evaluation of pain originating from various sources, metabolic mechanisms in diseases emanating from the oral cavity, hemorrhagic disorders accompanying oral disease, facial manifestations of systemic disorders and in the chapters on clinical entities involved in dental practice.

*I. Newton Kugelmass*

## OXYGEN INSUFFLATION IN PERIODONTAL DISEASES

*By Harold K. Box, D.D.S. 94 pages with 61 figures. Index. Price not listed. Springfield, Ill., Charles C Thomas, 1955.*

This little monograph of 94 pages was published in "the hope that through its publication, the day will be brought a little nearer when much greater importance will be assigned to periodontal diseases by the general practitioner of dentistry." The first 59 pages are devoted to the author's concept and classification of periodontal diseases. The final three chapters of text material are concerned with the technic of oxygen insufflation and its place in patient management. In addition, these chapters contain a brief consideration of the limited experimentation in this field.

The material on the nature of periodontal disease and the many photomicrographs stem, for the most part, from the work of the author, and the portion concerned with oxygen insufflation is based largely on the works of Dunlop (1913) and the author.

Dr. Box offers this classification of periodontal diseases: (1) simplex periodontitis, (2) necrotic periodontitis, which may be compared to periodontosis, and (3) complex periodontitis. Considerable space is devoted to the histopathologic interpretation of these disease processes. A working hypothesis for the development of "necrotic" and "complex periodontitis" is based on the release of an enzymatic "necrotizing agent" arising from the periodontal pocket. This agent infiltrates into the underlying periodontal connective tissues and lymphatic vessels, doing injury to the periodontium.

The technic of insufflation involves U.S.P. medical oxygen which is blown into the gingival tissues at a pressure of 30 pounds. If desired, the oxygen may be passed through certain drugs before it reaches the tissues. It is not stated clearly how this oxygenation of the tissues is beneficial, although some speculation as to the mechanism is offered in footnotes. Oxygen insufflation is suggested as an adjunct to other methods of therapy for all three classes of periodontal disease named. No

reference is made to a controlled series of patients treated with oxygen insufflation.

The many photomicrographs prepared from a limited amount of human material are not particularly good; footnotes are found on every fifth page and make for difficult reading. The use of inexact terms such as "indifferent tissue," "disorganized cuticle," "fibropenic lesions" and a "curious coagulum" are somewhat confusing.

*D. F. Mitchell and M. K. Hine*

## MEDICAL CARE FOR TOMORROW

*By Michael M. Davis. 497 pages. Index. Appendix. $6.50. New York, Harper & Brothers, 1955.*

How can dental service be incorporated in health insurance plans? Is the fee-for-service method of payment compatible with the scope of medical care now available? How much are we spending, and how much can we afford to spend for medical care? Thoughtful discussion of such questions is found in this richly informative work. The early chapters delineate the basic elements in medical services: the needs and demands of consumers, health manpower, facilities, organization and finances. The middle section reviews the evolution of hospitals, clinics, group practices and professional societies. The final chapters attempt to define long-range goals which are at once socially useful and desirable for medicine and suggests guide lines for private and public action for attaining these objectives.

With clarity and candor Dr. Davis explores the potentials of voluntary and compulsory health insurance in terms of their costs, benefits and coverage. The book includes a detailed examination of various methods of organizing and financing medical care. In Appendix B the author surveys the place of dentistry in health insurance programs. Dr. Davis notes the current imbalance between resources and needs and stresses the importance of establishing priorities for children's dentistry and of expanding dental public health programs throughout the nation.

Written in nontechnical style, this book is essential reading for the layman to whom medical care and its costs have become matters of concern, as well as for the health professional to whom the social and economic issues of modern health service are unfamiliar. Balanced in its judgments and analyses, this is perhaps the most comprehensive single volume in the field today. *Medical Care for Tomorrow* enriches a literature notable in the past for its contentiousness.

*Samuel Herman*

## PRACTICAL ORTHODONTICS

*By George M. Anderson, D.D.S. Eighth edition. 702 pages with 719 illustrations. Index. $17.50. St. Louis, C. V. Mosby Co., 1955.*

The author has expanded this edition so that it contains 24 per cent more text material and 12 per cent more illustrations than the previous edition. There has been a sincere effort to include in reasonable volume the many factors which aid in the treatment of malocclusion.

The term "normal occlusion" is analyzed and defined so that it better fits the adaptive pattern of the individual. The discussion of equilibration of occlusion to eliminate disharmonies and as an aid to orthodontic treatment adds to the value of the text.

Additions of material on anthropometric considerations and cephalometric appraisal indicate the importance each of these fields has assumed in orthodontic practice.

Extraction as an aid to treatment of various teeth is analyzed. Reasons for and against the practice are discussed in detail.

There is new material on cleft palate and the use of musculature as an aid in cleft closure in the newborn infant. The new subject of osteoporosis or craniotabes as it affects the skull, face, and jaws and influences malocclusion is included.

Information on mechanical improvements in the removable appliance field and extraoral anchorage procedures adds a measure of technical interest.

Orthodontics, its problems and methods of treatment, has been covered in a practical and understanding way, and this edition continues in the scholarly fashion and high standard that has always been associated with Anderson's *Practical Orthodontics.*

*William F. Ford*

## INFEKTION UND ANTISEPTIK IN DER STOMATOLOGIE (INFECTION AND ANTISEPSIS IN STOMATOLOGY)

*By E. Mischol. 168 pages with 48 illustrations. Index. 26.80 Swiss Francs. Berne, Hans Huber, 1955.*

This book contains a great quantity of valuable information on asepsis, antisepsis, methods of sterilization and disinfection, parasitism, preservative therapy, root canal treatment, oral surgery and focal and periapical infections. It contains a complete index, a comprehensive bibliography and a data chart on disinfection and sterilization.

The book is well bound and printed on high grade paper in readable type, and it is excellently illustrated with roentgenograms, drawings and photographs. It is regrettable that this work is not available in English, for it would be read and reread with interest by many of our professional men were it not for the language barrier.

*Paul H. Glucksman*

## DEUTSCHER ZAHNÄRZTE KALENDER 1956 (ALMANAC FOR GERMAN DENTISTS 1956)

*By Prof. Ewald Harndt. Fifteenth edition. 351 pages with 127 illustrations. Index. D.M. 9.80 München, Carl Hanser, 1956.*

This excellent almanac, designed by the editor and his contributors to be useful mainly to the German dental practitioner and specialist, accomplishes more than this purpose. The book offers a survey of almost every aspect of dental practice. Recent references are included in the bibliography at the end of each of the 20 contributions. Excellent use of both drawings and photographs clarifies the text and adequately illustrates methods of diagnosis, therapy and prescription writing.

This well printed book, with a complete index and lists of international measuring units, calory values of most foods, dental drugs and materials, and German dental associations and colleges, deserves the highest recommendation. The American dentist, interested in German dentistry, can be assured of many valuable hours of reading.

*Paul H. Glucksman*

## HUMAN PHYSIOLOGY

*By Bernard A. Houssay, M.D., Juan T. Lewis, M.D., Oscar Orias, M.D., Eduardo Braun-Menendez, M.D., Enrique Hug, M.D., Virgilio G. Foglia, M.D., and Luis F. Leloir, M.D. Second edition. 1,177 pages with 504 illustrations. Index. $12. New York, McGraw-Hill Book Co., 1955.*

This new edition of an internationally welcomed text presents all aspects of human physiology in both chemical and physical relationships. The eminent Dr. Houssay, a Nobel award winner, has incorporated in this revision the latest data in the field. Extensive modification and additions have been made in the sections on nutrition, carbohydrate metabolism, endocrine glands, electrical activity of the heart, mechanism of the conduction of nerve impulse and sexual physiology. The author and his collaborators have achieved in this treatise a remarkable unity of content and purpose.

The book is written for medical students and practitioners. It applies to physiology ideas taken from several sciences. It explains the functions of different organs and systems and integrates clinical and experimental studies of altered function. The book discusses the advances of physiology in every phase of the subject without undue emphasis on those areas of research in which the writers are particularly interested.

Physiologic function in health and disease is evaluated from the following standpoint: the internal environment and the blood, the circulation, respiration, digestion, metabolism and nutrition, internal secretions, reproduction, the formation and excretion of urine and the nervous system.

The book is well written by good teachers. It is factual, has clarity of style, is excellently illustrated. The authors show objectivity in judgments and wisdom in conclusions. Such a clear-cut evaluation of modern physiology should be perused from time to time by every practicing dentist.

*I. Newton Kugelmass*

## FEEDING YOUR CHILD

*By Samuel M. Wishik, M.D. 223 pages. Index. $3.50. New York, Doubleday & Co., Inc., 1955.*

The author explains to mothers and nurses the proper feeding of infants and young children. The book is a chatty interpretation of all the problems that pervade the home during the feeding period. Questions are answered about nursing, noises, crying, bubbling, belching and all such normal manifestations of food intake by youngsters. The approach is practical and sensible even though the author's attitude is negative. For example, he raises questions about nursing being a duty, about nursing spoiling the figure, about nursing tearing down the mother's health, about nursing affecting sexual feelings, rather than presenting the positive effects of nursing on both mother and baby.

The same negativistic attitude is obvious in the discussion of infant feeding. For example, the author stresses the initial loss of weight without explaining the physiological nature of the prelacteal feeding for minimizing the neonatal loss of weight. There is a negativistic discussion of snoring, difficult breathing and

colicky feelings instead of a discussion which would reflect a positive attitude towards the rhythmic function of the gastrointestinal tract.

There is no statement to the effect that every mother gradually learns to appraise the purpose of the child's cry. In the chapter on the young infant, the author stresses that the baby wants what he wants when he wants it. Obviously, that is a normal characteristic of an infant until training adapts him to the adult way of life. The type of formula and supplementary feedings are ever individual, to be formulated by the physician according to the needs of the infant.

The author does not urge early introduction of solid food which improves body build and resistance to infection. The statement that "a healthy animal eats but a child is not an animal" is ambiguous. The contention that a child eats to please himself rather than the parents is only part of the truth because of the psychological relationship built up between them which necessarily interferes with normal routine feeding. The better portion of the book is devoted to the feeding of the school child where intricate problems of management are less manifest.

*I. Newton Kugelmass*

## THE DENTIST AND THE LAW

*By Charles Wendell Carnahan, Ph.B., J.D., LL.M., Jur.Sc.D. First Edition. 263 pages. Index. $5.25. St. Louis, C. V. Mosby Co., 1955.*

In the preface, the author states that his objectives in writing this book are to impart to the practitioner an awareness of the legal problems connected with the practice of dentistry, to describe and explain the basic rules of law which the courts use in resolving these problems and to show the operation of legal rules in typical situations. In writing the book, the author has drawn on his experience in teaching a course in dental jurisprudence in the School of Dentistry of Washington University in St. Louis.

After explaining the nature, sources and divisions of the law and the judicial machinery in which it operates, the author discusses the basic legal duties that the practitioner owes to his patient as well as those owed by the patient to the practitioner. Among the subjects treated are the legal standards of skill required of the practitioner, the many aspects of the contractual relationship between the dentist and his patient, the concept of negligence and the legal doctrines surrounding malpractice suits.

Special sections are devoted to a discussion of the partnership arrangement and the legal responsibilities that the practitioner owes to persons other than his patients.

In addition, there is an instructive chapter on the dentist as a witness in court. Of interest, too, is the chapter on the rules of evidence which govern the trial of malpractice actions as it points up the usefulness of maintaining certain records and procedures in office practice in order that the practitioner might be prepared better to assume successfully the burden of proof that the court would impose on him in such a law suit.

In summary, the book is an excellent survey of the law as applied to dental practice and, as such, fills a great void in present day dental literature. Its defects are those of emphasis in certain areas and are minor when compared to the many merits of the book.

*Howard N. Greenblatt*

## HISTORY OF THE AMERICAN DENTAL ASSISTANTS ASSOCIATION: LADIES IN ATTENDANCE

*By Sadie Leach. 13 pages. Dayton, Ohio, American Dental Assistants Association, 1955.*

This Mimeographed pamphlet presents a simple, straightforward account of the history of dental assisting and of the American Dental Assistants Association, written by a woman who had served for eight years as editor of the *Dental Assistant*.

The association was organized in 1924 in Dallas, Texas, at a meeting held at the same time and place as the meeting of the American Dental Association. It represented about 200 dental assistants who, for several years, had been organized locally in New York City, Chicago, Buffalo, Cleveland and in several state associations. The president of the A.D.A.A. for the first six years was Juliette A. Southard, who had begun her career as a dental assistant in 1911 in the office of Henry Fowler.

The history lists the officers for each year, the recipients of the loyalty and achievement trophies and the most important events of each annual meeting. It traces the successful education activities conducted by the association, the relationship between the A.A.D.A. and organized dentistry and expresses the ideal of service which has permeated the A.A.D.A. and the profession since its inception.

By the twenty-fifth annual meeting of the A.A.D.A. in 1949 in San Francisco, the membership had increased to nearly 7,000. A

membership drive was launched in 1952, after a postcard survey had revealed there were more than 55,200 dental assistants in the United States.

The account is readable, and the material is well organized. This brief history should prove inspirational to girls contemplating becoming dental assistants.

*N. C. Hudson*

THE DENTAL ASSISTANT

*Edited by John C. Brauer, D.D.S. 398 pages with 126 illustrations. Index. $7. New York, McGraw-Hill Book Co., Inc., 1955.*

One of the outstanding advantages of this excellent textbook on the training of the dental assistant is the fact that it is not written from the viewpoint of one individual but represents the philosophy and knowledge of 13 men, who are both teachers and practicing dentists. Capably edited by John C. Brauer, who is also a contributor, it is an impressive addition to the rather meager list of texts on this subject. The book is designed to follow closely the curriculum recommended by the American Dental Assistants Association and as such can be especially helpful to study groups. It will be of use also to the dentist who must train a new assistant.

Historical background provided for the chapter on bacteriology by Grover C. Hunter, Jr., and for the one on anesthesia by Marvin E. Chapin gives students and instructors the relief that is needed from too close a preoccupation with theoretical and clinical material included in other chapters. The bibliography furnished at the end of each chapter suggests the opportunity for further reading and study by the assistant. Illustrations are adequate and up-to-date. A glossary of 761 terms is a valuable feature.

*Aileen M. Ferguson*

NUTRITION PRACTICES: A GUIDE FOR PUBLIC HEALTH ADMINISTRATORS

*By the Subcommittee on Nutrition Practices, Committee on Administrative Practice, American Public Health Association. 72 pages with illustrations. $1. New York, American Public Health Assn., 1955.*

The *Guide*, in bulletin form, has been prepared primarily as a handbook for administrators of public health departments. "Its purpose is to assist them to initiate, conduct, and evaluate nutrition services. Administrators of other health agencies and those professionally in charge of program units, together with students of public health administration, may find it helpful in comprehending the relationship of nutrition to the complete public health program."

Although the bulletin is directed primarily to a limited audience, it will be of interest to all dentists who are associated, directly or indirectly, with public health programs. Of the 14 chapters, the titles of four suggest particularly the practical approach made by the publication: nutrition's place in public health practice, determining opportunities for nutrition services, the total public health staff and nutrition services and ways nutritionists may contribute to departmental programs. Proposed relationships to public health dental programs are specifically outlined.

Other chapters deal succinctly with administrative problems such as the placement in a department of the nutrition program, qualifications of nutritionists for public health positions and actual job planning. The bulletin should fill a real need.

*Mrs. E. A. Martin*

HISTOPATHOLOGY OF THE TEETH AND THEIR SURROUNDING STRUCTURES

*By Paul E. Boyle, D.M.D. Fourth edition. 535 pages with 497 illustrations and 2 color plates. Index. Appendix. $10. Philadelphia, Lea & Febiger, 1955.*

The third edition of this popular book was printed in 1949, also with Dr. Boyle as editor. Both that and the current edition are worthy successors to the original volume by the late Rudolph Kronfeld and supply the need for adequate coverage of this subject. The fourth edition contains 30 more pages and 33 more illustrations than the third. The chapter on dental caries, again written by Ned B. Williams, has been completely revised to bring it up to the moment. Many of the new illustrations are from photographs produced by the electron microscope. All illustrations are of the same standard of excellence as those of the first edition.

The first three chapters deal with disorders of growth, anomalies and so forth. The fourth through the eighth cover the region affected by dental caries and the many regressive and inflammatory changes directly related to it. Tooth resorption and aging processes are discussed in two chapters. Four chapters are allotted to periodontal and related changes. The conditions in the jaws associated with orthodontic treatment and embedded teeth

are portrayed in two chapters. Next follow chapters on tooth fracture, healing of extraction wounds, Vincent's disease, common disorders of the oral mucosa and a brief treatment of tumors of the oral cavity. The book closes with addenda on toothache and its differential diagnosis.

This material is not limited strictly to histopathology but includes much closely related matter of a pathological and anatomical nature. It is highly recommended to all students and teachers in dental schools; indeed it should be regarded as indispensable. Dr. Boyle and those who collaborated with him are authorities in this field; their contributions are strongly fortified by abundant references to the literature in the form of excellent bibliographies at the end of each chapter. The book's use is not limited to the classroom; clinicians and pathologists in other specialties will profit by studying it. The style is relatively simple and the presentation clear and logical. The publisher has cooperated fully with the author in every respect to make this an outstanding volume.

*Edward H. Hatton*

## NEEDED RESEARCH IN HEALTH AND MEDICAL CARE

*By Cecil G. Sheps, M.D., M.P.H., and Eugene H. Taylor, M.D., M.P.H. 216 pages. Index. $5. Chapel Hill, The University of North Carolina Press, 1954.*

This book is the outgrowth of a three day multidisciplinary seminar at Chapel Hill on the next steps in health and medical research. It is based on a conviction that since medicine is potentially a social as well as a biophysical science, its further progress requires continuing and fruitful collaboration between medical and social scientists. The primary virtue of this book is its success in providing a framework for such collaboration.

It becomes apparent to the discerning reader that biosocial research holds the key to a clarification of the role of group membership and other factors in the cultural environment as predisposing or prolonging causes of disease. The seminar considered four major areas of research: social physiology, social epidemiology, social science research in health and administration.

In addition to indicating the scope and direction of biosocial research, there is considerable discussion of the advantages and disadvantages of various methods of study as well as of special organizational problems. The selected preseminar memoranda are of particular value in pointing out the potentialities of biosocial research for broadening our understanding of the patient-doctor relationship and for determining the nature and evaluating the effects of preventive medicine.

This reviewer was impressed by the critical thinking and insight incorporated in this volume. It surely merits wide reading by dental and medical educators and by those in private and public agencies interested in the financial support of health and medical research.

*Samuel Herman*

## PRINCIPLES AND PRACTICE OF THE DENTAL ASSISTANT

*By Samuel Fine, D.M.D. 66 pages with 21 illustrations. Index. $3. Worcester, Mass., The Hamilton Publishing Co., 1955.*

*Principles and Practice of the Dental Assistant* provides detailed and specific instructions to the dental assistant in the performance of her tasks in the dental office. It covers her duties in the reception room, in the operating room and laboratory, her secretarial tasks and those operations in which she assists the dentist at the chair. In addition, there are short chapters on the anatomy of the maxilla and mandible, on bacteriology as applied to dental practice, on materia medica and therapeutics.

Among the tasks described are the greeting of patients, the tactful collection of fees, care of equipment, the mixing of amalgam and cement, instruction of patients in proper methods of toothbrushing and the developing of roentgenograms.

The author has included short definitions of scientific terms which the dentist uses frequently and which the assistant should know. The names of dental instruments and their uses also are described.

The chapters are accompanied by photographs and diagrams showing such things as appointment cards, statement forms, dental instruments and mouth charts. A diagram of tooth structure accompanies the description of the various teeth and one on the jaws accompanies the chapter on anatomy. In the latter diagram, the maxillary tuberosity is incorrectly labeled "tuberosity of the mandible." The text itself is correct.

The inclusion of the chapters on anatomy, bacteriology and pathology should help the assistant understand the purpose of the tasks she performs and make her job more meaningful to her. The chapter on anatomy explains what parts of the face or mouth are anesthetized by the various injections made by

the dentist, that on bacteriology lists the most common bacteria found in the mouth, explains the relation of focal infection to systemic manifestations and describes sterilization, disinfection and the use of antiseptics. The chapter on materia medica lists the most common drugs found in the dental office, their uses and antidotes.

The book is well organized. Instructions are given in list form and numbered according to the order in which each step is to be taken. The language and sentence structure are simple. The book should be particularly useful to a dental assistant on her first job and might well remind the dentist of what he as teacher should tell his new assistant.

*D. Zabin*

## A COMPREHENSIVE REVIEW OF DENTISTRY

*Edited by Vincent R. Trapozzano, D.D.S. Second edition. 665 pages. Index. $8. Philadelphia, W. B. Saunders Co., 1955.*

The publication of a second edition of this useful and popular book will be welcome news to those taking state and national board examinations and also to the dentists who merely wish to keep abreast of current ideas, materials and technics.

To the outstanding list of contributors to the first edition, the name of Lester W. Burket has been added. He and Michael G. Wohl have contributed the chapter entitled "Aspects of Nutrition." Wohl is, of course, a recognized authority on diet. This chapter contains a wealth of general information on adequate diet, functions of the vitamins, manifestations of dietary deficiencies and dental aspects of nutrition. This chapter like the rest of the book is in question and answer form.

The chapter by E. W. Skinner, "Dental Materials," explains the terms "agar hydrocolloids" and "alginate hydrocolloids" and should clarify some of the confusion regarding the classification of the alginates. This chapter is a good refresher course on dental materials.

Some of the chapters such as those on pathology, internal medicine and dental medicine give answers which are sufficiently complete to be useful for actual diagnosis and treatment and not merely to prepare for board examinations.

Most of the chapters contain lists of references. In some cases, the lists have been revised and are in the main up-to-date. In a few instances, much later editions of books have been published than the ones listed. On page 584, for example, the 1940 edition of the book by M. W. Swenson entitled *Complete Dentures* is listed. There is a third edition of this book published in 1953. This failure to list the last edition is a fault which is found too commonly.

In general, this is a fine book containing a fund of information on a great variety of subjects.

*Josephine P. Hunt*

## PREVENTIVE DENTISTRY

*By Joseph C. Muhler, Ph.D.; Maynard K. Hine, M.S., and Harry G. Day, Sc.D. 336 pages with 42 illustrations and 85 tables. Indexes. $8.50. St. Louis, C. V. Mosby Co., 1954.*

This text, as the authors explain, was prepared primarily to provide the student, general practitioner and public health worker with useful information on the latest developments in those fields of science which contribute to preventive dentistry. The subjects discussed in the 13 chapters include: survey of histology, pathology and calcification of specialized dental tissues; dynamics of enamel and dentin; diagnosis and evaluation of dental caries; natural resistance to dental caries; tests for caries activity; the effect of various bacteriostatic agents on dental caries; the effect of quinones, nitrofurans and of impregnating erupted teeth on the incidence of dental caries; refined carbohydrates and dental caries; fluorine and dental caries; nutrition; prevention of periodontal disease and prevention of fatalities from cancer of the oral cavity.

The book presents much valuable material and should be particularly useful to the student or practitioner who does not have access to a large dental library. The topics discussed are those most frequently presented at research meetings and about which many practitioners and students seek information. Each chapter closes with a list of references to key books and articles on the subject discussed.

Although the quality of the chapters is somewhat uneven, the book presents much basic material on the prevention and control of dental disease. The illustrations, tables and charts are excellently chosen, and the quality of paper and binding superior to that in many textbooks of this character.

*N. C. Hudson*

# *Deaths*

Adams, Robert, Philadelphia; Medico-Chirurgical College of Virginia, 1903; died May 27; aged 72.

Allen, Thomas B., Richmond, Va.; Dental Department, University College of Medicine, Richmond, 1912; died October 18; aged 68.

Anderson, Thomas A., Syracuse, N. Y.; School of Dentistry, Georgetown University, 1934; died November 12; aged 45.

Andrew, Lewis J., Rockford, Ill.; Chicago College of Dental Surgery, Loyola University, 1899; died May 19, 1955; aged 86.

Baker, James R., Poteau, Okla.; Kansas City-Western Dental College, 1927; died November 10; aged 59.

Bardellini, Delos A., Daly City, Calif.; College of Dentistry, University of Iowa, 1915; died November 28; aged 64.

Barringer, William A., Charleston, West Va.; College of Dental Surgery, University of Michigan, 1910; died November 17; aged 66.

Bently, Clayton H., Spokane, Wash.; died October 29; aged 86.

Blum, Henry, New York; New York College of Dentistry, 1909; died October 21; aged 77.

Bockey, Charles C., Escondido, Calif.; School of Dentistry, Georgetown University, 1914; died November 22; aged 67.

Boyd, Bert, Los Angeles; College of Dentistry, University of Southern California, 1903; died November 11; aged 83.

Boyd, John B., Havana, Ill.; Dental School, Northwestern University, 1923; died November 16; aged 60.

Brodie, Jock, Pittsburgh; School of Dentistry, University of Pittsburgh, 1934; died October 1.

Brown, Henry S., Los Angeles; School of Dentistry, Temple University, 1898; died October 14; aged 80.

Brown, James S., Canton, Miss.; School of Dentistry, Vanderbilt University, 1892; died May 6, 1955; aged 84.

Bruckheimer, Milton P., New York; New York College of Dentistry, 1903; died July 31; aged 74.

Brusletten, Leonard C., Faribault, Minn.; College of Dentistry, University of Minnesota, 1915; died November 23; aged 66.

Burch, Ray W., Fort Lauderdale, Fla.; College of Dental Surgery, University of Michigan, 1912; died October 19; aged 68.

Butt, Thomas J., Cairo, Ga.; Atlanta Dental College, 1899; died November 9; aged 80.

Campbell, Paul J., Seattle; College of Dentistry, Creighton University, 1914; died November 18; aged 63.

Carmichael, Daniel D., Le Roy, N. Y.; School of Dentistry, University of Buffalo, 1905; died November 3; aged 76.

Carroll, Lawrence A., Mukwonago, Wis.; Dental School, Marquette University, 1919; died September 5; aged 63.

Caskey, Robert A., Madeira, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1912; died November 28; aged 67.

Chalfin, Jacob L., Philadelphia; Pennsylvania College of Dental Surgery, Philadelphia, 1905; died November 27; aged 75.

Cochrane, Leonard W., Joplin, Mo.; Des Moines College of Dental Surgery, 1901; died November 19; aged 86.

Connelly, William A., Reading, Mass.; Dental School, Harvard University, 1917; died November 6; aged 63.

Crosby, Frank E., Franklin, Pa.; School of Dentistry, University of Pennsylvania, 1901; died November 12; aged 79.

Crump, Thomas A., Phoenix, Ariz.; College of Dentistry, University of Southern California, 1929; died in November; aged 49.

Cunningham, Gregory E., Cedarburg, Wis.; Dental School, Marquette University, 1917; died July 10; aged 59.

Dalve, Frank E., Great Falls, Mont.; Dental School, Northwestern University, 1935; died November 25; aged 45.

Daughady, Alfred T., Brady, Mont.; died July 29; aged 79.

David, Paul, Brooklyn; New York College of Dentistry, 1910; died October 4.

Davis, Charles A., Knoxville, Tenn.; Dental Department, Meharry Medical College, 1906; died November 8; aged 77.

Deacon, Arthur P., Marysville, Calif.; died November 10; aged 85.

DeLong, Clarence S., Reading, Pa.; School of Dentistry, University of Pennsylvania, 1910; died November 17; aged 68.

Dingle, Edmund W., Philadelphia; College of Dentistry, Howard University, 1923; died August 27; aged 57.

Dudley, Robert Y., San Clemente, Calif.; died November 12; aged 86.

Duncan, Arnold G., Zelienople, Pa.; Baltimore College of Dental Surgery, 1899; died October 27; aged 83.

Edmundson, James R., Wilson, N. C.; Dental Department, University College of Medicine, Richmond, 1898; died in 1953.

Fagan, Daniel P., Prairie du Chien, Wis.; Dental School, Marquette University, 1925; died October 14; aged 55.

Farnsworth, French M., Buckhannon, W. Va.; Baltimore College of Dental Surgery, University of Maryland, 1912; died November 11; aged 64.

Fifield, F. J., St. Paul; died October 22; aged 73.

Fischer, E. C., Watertown, S. D.; died October 15; aged 80.

Fleming, Oatman W., Big Sandy, Tenn.; College of Dentistry, University of Tennessee, 1900; died March 18, 1955; aged 77.

Flood, Charles A., Lynn, Mass.; Dental School, Tufts College, 1911; died November 13; aged 73.

Fowler, Robert C., Washington, D. C.; Dental Department, George Washington University, 1912; died November 17; aged 69.

Frank, Howard L., East Rochester, N. Y.; School of Dentistry, University of Buffalo, 1913; died May 28, 1955; aged 64.

Frew, Athol L., Dallas, Texas; Dental Department, University of Maryland, 1905; died November 6; aged 76.

Friedman, David A., Denver; Denver College of Dentistry, 1925; died October 26; aged 55.

Fulton, Hobart S., Mount Vernon, Mo.; Kansas City Dental College, 1918; died October 15; aged 59.

Girvin, Walter V., Ashville, N. Y.; School of Dentistry, University of Buffalo, 1907; died November 10; aged 74.

Goldstein, Eli, Brooklyn; Dental School, Tufts College, 1935; died October 25; aged 43.

Goodwin, James S., Concord, Mass.; School of Dentistry, Georgetown University, 1917; died November 23; aged 65.

Gradoville, Charles M., Omaha; College of Dentistry, University of Nebraska, 1926; died October 24; aged 59.

Gregg, Albert L., Cleveland; died September 4; aged 89.

Griffith, Clyde W., South Bend, Ind.; Indiana Dental College, 1900; died June 23; aged 76.

Haberstick, Frederick T., Belmar, N. J.; School of Dentistry, University of Pennsylvania, 1905; died November 6; aged 69.

Hancock, Buford, Atlanta; Atlanta Dental College, 1909; died October 7; aged 68.

Harnick, Harry M., Chicago; College of Dentistry, University of Illinois, 1916; died December 4; aged 69.

Harrigan, Mark L., Philadelphia; School of Dentistry, University of Pittsburgh, 1923; died November 2; aged 55.

Haverkost, William A., Mahanoy City, Pa.; School of Dentistry, University of Pennsylvania, 1919; died October 3; aged 86.

Haverstick, Edward E., St. Louis; School of Dentistry, Washington University, St. Louis, 1901; died November 26; aged 81.

Hedges, Robert M., Dayton, Ohio; College of Dentistry, Ohio State University, 1953; died November 16; aged 28.

Helpgod, Rubeen, New York; New York College of Dentistry, 1919; died September 5; aged 64.

Henderson, Lewis S., Parsons, Kan.; Kansas City-Western Dental College, 1921; died November 21; aged 58.

Henderson, Rufus R., Nacogdoches, Texas; New Orleans College of Dentistry, 1908; died October 16; aged 69.

Herman, Raymond C., Williamsville, N. Y.; School of Dentistry, University of Buffalo, 1917; died May 12, 1955; aged 62.

Hipple, John S., Pittsburgh; Pittsburgh Dental College, Western University of Pennsylvania, 1906; died October 15; aged 72.

Holloway, O. Woods, Reidsville, N. C.; died November 14.

Houghton, Marvin J., Des Moines, Iowa; College of Dental Surgery, University of Michigan, 1900; died October 29; aged 77.

Hughes, Lacey H., Jackson, Miss.; Atlanta-Southern Dental College, 1925; died November 4; aged 55.

Hutchinson, Robert B., Lubbock, Texas; State Dental College, Dallas, 1913; died September 24; aged 71.

Imig, Oscar E., Sheboygan, Wis.; Ohio College of Dental Surgery, University of Cincinnati, 1904; died July 28; aged 80.

Jaffe, William C., Brooklyn; School of Dentistry, Temple University, 1930; died October 8; aged 56.

Johnson, E. Randall, Buffalo; College of Dental Surgery, University of Michigan, 1889; died October 25; aged 88.

Johnson, Henry B., Blackwell, Okla.; Western Dental College, Kansas City, 1918; died November 29; aged 61.

Juel, Edwin C., Los Angeles; Dental School, Northwestern University, 1915; died June 14; aged 63.

Kania, Stephen J., Milwaukee; Dental School, Marquette University, 1930; died November 14; aged 50.

Knoll, Thaddeus C., Pittston, Pa.; School of Dentistry, University of Pittsburgh, 1928; died November 3; aged 52.

Kramer, George, Malden, Mass.; Dental School, Tufts College, 1912; died November 24; aged 69.

Krbecek, Arthur J., Glenwood Landing, N. Y.; New York College of Dentistry, 1913; died May 24, 1955; aged 64.

Lavelle, Walter B., Philadelphia; School of Dentistry, University of Pennsylvania, 1901; died November 10; aged 76.

Leary, Robert D., Worcester, Mass.; Pennsylvania College of Dental Surgery, Philadelphia, 1902; died November 23; aged 92.

Leichter, David H., Goshen, N. Y.; College of Dentistry, New York University, 1927; died May 30, 1955; aged 51.

Lindner, Manuel, Spring Valley, N. Y.; College of Dentistry, New York University, 1943; died October 21; aged 37.

Lower, Marion M., Canton, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1903; died November 14; aged 77.

**Lyke, John B., Sheboygan, Wis.; Dental Department, Milwaukee Medical College, 1900; died October 11; aged 78.**

Lynch, Homer M., Columbus, Ohio; Atlanta Dental College, 1902; died November 20; aged 74.

MacFarland, Gordon S., Wynnewood, Pa.; School of Dentistry, University of Pennsylvania, 1931; died October 19; aged 55.

Mackey, William J., Seattle; School of Dentistry, University of Washington, Seattle, 1951; died September 19; aged 33.

Mayo, Harold W., Falmouth, Mass.; Dental School, Tufts College, 1914; died October 14; aged 64.

Meagher, Matthew A., Hoosick Falls, N. Y.; Dental School, Tufts College, 1916; died May 8; aged 67.

Megaw, Elmer E., Brooklyn; New York College of Dentistry, 1903; died September 3; aged 75.

Melin, Henry V., Alma, Mo.; School of Dentistry, St. Louis University, 1908; died October 16; aged 74.

Mentzer, Judd A., Thermopolis, Wyo.; College of Dentistry, University of Iowa, 1900; died September 8; aged 85.

Merritt, William E., Jackson, Mich.; Dental School, Northwestern University, 1892; died August 10; aged 88.

Miett, Elmer P., Haverhill, Mass.; died July 22; aged 71.

Milcoff, Isaac, Cleveland; College of Dentistry, Western Reserve University, 1915; died November 10; aged 72.

Miller, Cecil J., Butler, Ind.; Chicago College of Dental Surgery, Loyola University, 1920; died May 11, 1955; aged 60.

Miller, Ferdinand W., Uvalde, Texas; died October 9; aged 63.

Miller, Harry A., Denver; School of Dentistry, University of Denver, 1911; died October 6; aged 71.

Miller, Thomas G., Oak Park, Ill.; Chicago College of Dental Surgery, Loyola University, 1914; died October 5; aged 63.

Mingle, Christian W., Philadelphia; Pennsylvania College of Dental Surgery, Philadelphia, 1908; died August 29; aged 69.

Mitchell, Harry E., Omaha; College of Dentistry, Creighton University, 1910; died September 1; aged 74.

Mixer, Clark T., Muskegon Heights, Mich.; College of Dental Surgery, University of Michigan, 1911; died September 15; aged 68.

Moir, William H., Detroit; College of Dental Surgery, University of Michigan, 1920; died August 21; aged 59.

Monson, Harry A., Sharon, Pa.; Dental School, Northwestern University, 1920; died October 4; aged 62.

Montfort, Clive W., Plainfield, N. J.; School of Dentistry, University of Pennsylvania, 1902; died May 13, 1955; aged 75.

Moore, David R., Duncan, Okla.; Western Dental College, Kansas City, 1905; died May 4, 1955; aged 83.

Morrison, Ralph L., Washington, D. C.; Dental Department, George Washington University, 1919; died September 3; aged 62.

Moseley, William X., Crowley, La.; School of Dentistry, Tulane University, 1910; died July 9; aged 64.

Murray, William A., Evanston, Ill.; Dental School, Northwestern University, 1916; died September 19; aged 60.

Myers, William A., Auburn, N. Y.; School of Dentistry, University of Buffalo, 1905; died August 27; aged 72.

Nagle, Rudolph P., Milwaukee; College of Dental Surgery, University of Michigan, 1888; died October 12; aged 92.

Nellermoe, Arthur F., Madison, Minn.; College of Dentistry, University of Minnesota, 1912; died October 27; aged 64.

Nelson, Carl F., Washington, D. C.; School of Dentistry, Georgetown University, 1911; died October 2; aged 62.

Nevin, Hillard R., Brooklyn; Faculty of Dentistry, University of Toronto, 1938; died August 12; aged 42.

Newman, Louis, Chicago; College of Dentistry, University of Illinois, 1909; died November 22; aged 74.

Nickey, John D., Scranton, Pa.; School of Dentistry, Temple University, 1919; died August 24; aged 59.

Norton, Alice M., Philadelphia; Pennsylvania College of Dental Surgery, Philadelphia, 1899; died October 21; aged 86.

Nutlay, Alexander G., Watertown, Mass.; Faculty of Dentistry, Dalhousie University, Halifax, 1940; died September 3; aged 54.

Olsen, Alfred L., Ithaca, N. Y.; School of Dentistry, University of Buffalo, 1939; died October 9; aged 56.

O'Malley, Joseph M., Lowell, Mass.; Medico-Chirurgical College of Philadelphia, 1915; died November 13; aged 67.

Orr, Alfred L., Philadelphia; Pennsylvania College of Dental Surgery, Philadelphia, 1903; died September 30; aged 80.

Overbey, Horace, Ryan, Okla.; State Dental College, Houston, 1907; died in November; aged 71.

Ownby, Thomas J., Brooklyn; Kansas City-Western Dental College, 1931; died October 18; aged 47.

Pace, Robert J., Los Angeles; College of Dentistry, University of Southern California, 1916; died September 2; aged 77.

Palmer, Robert B., Auburn, Wash.; Pennsylvania College of Dental Surgery, Philadelphia, 1901; died October 9; aged 77.

Park, Frank T., Modesto, Calif.; College of Physicians and Surgeons, San Francisco, 1930; died September 27; aged 52.

Parker, H. Eugene, Davenport, Iowa; College of Dentistry, University of Iowa, 1927; died August 16; aged 50.

Parker, Moses L., El Paso, Texas; School of Dentistry, Vanderbilt University, 1906; died August 21; aged 72.

Parkhurst, Charles E., Somerville, Mass.; Dental School, Harvard University, 1897; died August 20; aged 85.

Parks, Willard J., Cleveland, Tenn.; Ohio College of Dental Surgery, University of Cincinnati, 1913; died July 23; aged 66.

Patterson, Archie L., Florence, Colo.; School of Dentistry, University of Denver, 1917; died September 29; aged 61.

Patterson, William K., Green Bay, Wis.; Dental School, Marquette University, 1921; died September 19; aged 57.

Payne, Everett A., Pine Bluff, Ark.; School of Dentistry, Vanderbilt University, 1905; died November 8; aged 72.

Peebles, William F., Los Angeles; Ohio College of Dental Surgery, University of Cincinnati, 1894; died October 9; aged 87.

Pellizzari, Frank J., Port Hueneme, Calif.; School of Dentistry, St. Louis University, 1952; died September 4; aged 30.

Penn, John J., Ashland, Wis.; College of Dentistry, University of Minnesota, 1939; died June 7; aged 52.

Peterson, Bert D., Indianapolis; Indiana Dental College, 1904; died November 11; aged 76.

Phillips, Oliver W., Marshall, Texas; Dental Department, Meharry Medical College, 1921; died September 16; aged 59.

Pierre, Herbert H., Jordan, Minn.; College of Dentistry, University of Minnesota, 1924; died November 16; aged 55.

Potts, Joseph L., Ocala, Fla.; Dental Department, Meharry Medical College, 1929; died August 8; aged 52.

Potts, Lemuel E., Pottstown, Pa.; School of Dentistry, University of Pennsylvania, 1910; died May 13, 1955; aged 70.

Powell, Jordan B., Ahoskie, N. C.; School of Dentistry, Medical College of Virginia, 1934; died July 3; aged 43.

Powell, L. G. A., South Bend, Ind.; Chicago College of Dental Surgery, Loyola University, 1896; died June 4; aged 83.

Prettyman, Raymond B., Clearwater, Fla.; Department of Dentistry of Central University, Richmond, 1897; died July 14; aged 79.

Price, William B., Granfield, Okla.; School of Dentistry, Vanderbilt University, 1907; died April 14, 1955; aged 74.

Purcell, Thomas E., Kansas City, Mo.; Kansas City Dental College, 1897; died August 22; aged 81.

Purdom, Richard C., Bozeman, Mont.; Chicago College of Dental Surgery, Loyola University, 1902; died October 14; aged 76.

Purviance, Samuel J., Hudson, Ind.; Indiana Dental College, 1918; died April 30, 1955; aged 60.

Queen, Harry H., Miami, Fla.; New York College of Dentistry, 1908; died October 31; aged 77.

Quinlan, Raymond M., Passaic, N. J.; School of Dentistry, Washington University, St. Louis, 1934; died August 3; aged 47.

Ragan, Walter H., Kansas City, Mo.; Western Dental College, Kansas City, 1910; died July 30; aged 68.

Reagin, Ira W., Christopher, Ill.; School of Dentistry, Vanderbilt University, 1911; died July 5; aged 70.

Reamer, Harry B., Pittsburgh; Pittsburgh Dental College, Western University of Pennsylvania, 1898; died October 24; aged 81.

Remlinger, Joseph E., Atlantic City, N. J.; School of Dentistry, University of Pittsburgh, 1917; died October 9; aged 67.

Renehan, John L., Hartford, Conn.; Baltimore College of Dental Surgery, University of Maryland, 1913; died October 30; aged 68.

Ressler, Hubert B., Hartsdale, N. Y.; School of Dentistry, University of Pittsburgh, 1942; died May 4, 1955.

Revesz, Karl D., New York; School of Dentistry, University of Pittsburgh, 1941; died September 3; aged 54.

Rice, Guy F., Harbor, Ore.; College of Dentistry, University of Southern California, 1915; died July 31; aged 63.

Rice, John K., Philadelphia; Dental Department, Meharry Medical College, 1923; died July 30; aged 57.

Richards, C. M., Minneapolis; Dental School, Northwestern University, 1906; died July 29; aged 76.

Roche, John E., Detroit; Department of Dental Surgery, Detroit College of Medicine, 1896; died June 9; aged 86.

Rolston, William J., Natrona, Pa.; Baltimore College of Dental Surgery, 1896; died October 26; aged 86.

Rosenberg, Henry, Yonkers, N. Y.; College of Dentistry, University of Tennessee, 1919; died September 8; aged 57.

Rosenberg, S. Seymour, St. Augustine, Fla.; New York College of Dentistry, 1906; died September 24; aged 70.

Rosenblum, Leo, New York; College of Dentistry, New York University, 1934; died August 22; aged 46.

Rowell, George H., Virginia, Minn.; College of Dentistry, University of Minnesota, 1912; died July 20; aged 65.

Ruby, George, Philadelphia; Medico-Chirurgical College of Philadelphia, 1907; died August 7; aged 76.

Russell, John N., Meriden, Conn.; School of Dentistry, Georgetown University, 1913; died August 30; aged 63.

Russo, Frank H., Dorchester, Mass.; Dental School, Tufts College, 1925; died April 26, 1955; aged 56.

Russum, Gale E., Dayton, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1912; died September 10; aged 65.

Rutherford, Donald I., Harrisburg, Pa.; Pennsylvania College of Dental Surgery, Philadelphia, 1908; died May 6, 1954; aged 74.

Samuels, Alexander, Forest Hills, N. Y.; Dental School, Harvard University, 1918; died August 13; aged 64.

Sandel, Morris, Houston, Texas; died October 5; aged 76.

Saunders, T. Darwin, Hornell, N. Y.; School of Dentistry, University of Pennsylvania, 1892; died June 7; aged 84.

Schmidt, Clarence E., Appleton, Wis.; Chicago College of Dental Surgery, Loyola University, 1906; died August 31; aged 70.

Schoonmaker, Perry L., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, Portland, 1932; died September 28; aged 46.

Secrest, Jasper E., Cambridge, Ohio; College of Dentistry, Ohio Medical University, 1905; died October 7; aged 79.

Sell, Richard A., Detroit; College of Dental Surgery, University of Michigan, 1919; died August 3; aged 59.

Sexton, E. Herbert, Plainfield, N. J.; School of Dentistry, University of Pennsylvania, 1932; died August 10; aged 46.

Shai, Neill E., Charleston, W. Va.; Cincinnati College of Dental Surgery, 1908; died July 17; aged 65.

Shapiro, Anne R., New York; School of Dentistry, University of Buffalo, 1917; died September 23; aged 58.

Shaw, John O., Mobile, Ala.; died October 19; aged 82.

Sherrard, Ralph A., Kirkwood, Mo.; School of Dentistry, Washington University, St. Louis, 1910; died August 23; aged 69.

Shimek, Benedict A., Chippewa Falls, Wis.; College of Dentistry, University of Minnesota, 1922; died November 9; aged 59.

Shulman, Abraham, Philadelphia; School of Dentistry, Temple University, 1931; died August 21; aged 47.

Silver, Jack, New York; College of Dentistry, New York University, 1945; died June 23; aged 35.

Sinn, Jens J., Manning, Iowa; Dental School, Northwestern University, 1902; died July 13; aged 80.

Siris, Isador S., Wildwood, N. J.; Pennsylvania College of Dental Surgery, Philadelphia, 1909; died October 24; aged 69.

Skidmore, Joel L., Northport, N. Y.; died October 3; aged 75.

Sloman, Victor E., San Francisco; College of Physicians and Surgeons, San Francisco, 1929; died September 14; aged 64.

Smith, Charles S., Phoenixville, Pa.; died October 10; aged 80.

Smith, Samuel S., Derry, Pa.; Medico-Chirurgical College of Philadelphia, 1902; died November 14.

Spatz, Irving, New York; School of Dental and Oral Surgery, Columbia University, 1940; died September 20; aged 40.

Spaulding, Roy L., Helena, Mont.; College of Dental Surgery, University of Michigan, 1902; died May 27; aged 77.

Spiro, Jesse W., Hoboken, N. J.; Medico-Chirurgical College of Philadelphia, 1911; died November 24; aged 69.

Sproule, Samuel W., Detroit; School of Dentistry, Royal College of Dental Surgeons, Toronto, 1918; died August 27; aged 61.

Stanfield, Charles W., Springfield, Ill.; American College of Dental Surgery, Chicago, 1891; died May 3, 1955; aged 86.

Stansbery, Claud J., Seattle; College of Dentistry, University of California, 1905; died November 1; aged 77.

Steahlin, Paul K., Colorado Springs, Colo.; School of Dentistry, University of Denver, 1924; died October 7; aged 52.

# *Directory*

## OFFICERS

Bernerd C. Kingsbury, President.....490 Post St., San Francisco
Harry Lyons, President-Elect...School of Dentistry, Medical College of Virginia, Richmond, Va.
Francis J. Herz, First Vice-President.....450 Sutter St., San Francisco
Magnus C. Hansen, Second Vice-President.....420 Seventh St., Racine, Wis.
Marvin E. Kennebeck, Third Vice-President.....USAF, DC, Office of the Surgeon General, Washington, D.C.
Gerald D. Timmons, Speaker, House of Delegates.....3223 N. Broad St., Philadelphia
Harold Hillenbrand, Secretary.....222 E. Superior St., Chicago
C. Willard Camalier, Assistant Secretary.....1726 Eye St., N.W., Washington, D.C.
Louis M. Cruttenden, Assistant Secretary.....222 E. Superior St., Chicago
H. B. Washburn, Treasurer.....Lowry Medical Arts Bldg., St. Paul
Lon W. Morrey, Editor.....222 E. Superior St., Chicago

## BOARD OF TRUSTEES

Arthur W. Easton, 1958, First District.....171 Main St., Norway, Maine
Earl G. Jones, 1958, Seventh District.....185 E. State St., Columbus, Ohio
A. F. Schopper, 1958, Sixth District.....Professional Bldg., Kansas City, Mo.
Lewis W. Thom, 1958, Tenth District.....Medical Arts Bldg., Minneapolis
John R. Abel, 1957, Thirteenth District.....405 N. Bedford Dr., Beverly Hills, Calif.
William R. Alstadt, 1957, Twelfth District.....Boyle Bldg., Little Rock, Ark.
Percy T. Phillips, 1957, Second District.....18 E. 48th St., New York
Clarence S. Renouard, 1957, Eleventh District.....Phoenix Bldg., Butte, Mont.
Howard B. Higgins, 1956, Fifth District.....Montgomery Bldg., Spartanburg, S.C.
L. H. Jacob, 1956, Eighth District.....Jefferson Bldg., Peoria, Ill.
Paul H. Jeserich, 1956, Ninth District.....School of Dentistry, University of Michigan, Ann Arbor, Mich.
Charles H. Patton, 1956, Third District.....235 S. 15th St., Philadelphia
Edward R. White, 1956, Fourth District.....921 Bergen Ave., Jersey City

## BUREAUS

*Dental Health Education:* Perry J. Sandell, Director, 222 E. Superior St., Chicago
*Economic Research and Statistics:* B. D. Moen, Director, 222 E. Superior St., Chicago
*Library and Indexing Service:* Donald A. Washburn, Director, 222 E. Superior St., Chicago
*Public Information:* Herbert B. Bain, Director, 222 E. Superior St., Chicago

## COUNCILS

*Constitution and Bylaws:* F. A. Pierson, Chm., Federal Securities Bldg., Lincoln, Neb.

*Dental Education:* Gerald D. Timmons, Chm., 3223 N. Broad St., Philadelphia
Shailer Peterson, Secy., 222 E. Superior St., Chicago

*Dental Health:* Raymond F. D. Johnson, Chm., Marquette Bank Bldg., Minneapolis
R. H. Friedrich, Secy., 222 E. Superior St., Chicago

*Dental Research:* Thomas J. Hill, Chm., 2085 Adelbert Rd., Cleveland
H. Trendley Dean, Secy., 222 E. Superior St., Chicago

*Dental Therapeutics:* Lester W. Burket, Chm., 4001 Spruce St., Philadelphia
J. Roy Doty, Secy., 222 E. Superior St., Chicago

*Dental Trade and Laboratory Relations:* Walter E. Dundon, Chm., 111 N. Wabash Ave., Chicago
Bernard J. Beazley, Secy., 222 E. Superior St., Chicago

*Federal Dental Services:* F. J. Reichmann, Chm., Medical Arts Bldg., Oklahoma City
Bernard J. Beazley, Secy., 222 E. Superior St., Chicago

*Hospital Dental Service:* Frank B. Hower, Chm., Heyburn Bldg., Louisville, Ky.
Gerard J. Casey, Secy., 222 E. Superior St., Chicago

*Insurance:* J. S. Eilar, Chm., 7 Medical Arts Square, N.E., Albuquerque, N. Mex.
Paul W. Zillmann, Secy., 29 Walden Ave., Buffalo

*International Relations:* O. A. Oliver, Chm., 1915 Broadway, Nashville, Tenn.

*Journalism:* W. L. Barnum, Chm., Morgan Bldg., Portland, Ore.

*Judicial:* H. B. McCarthy, Chm., College of Dentistry, Baylor University, Dallas, Texas
Bernard J. Conway, Secy., 222 E. Superior St., Chicago

*Legislation:* Paul E. Jones, Chm., 3 E. Church St., Farmville, N.C.
Bernard J. Conway, Secy., 222 E. Superior St., Chicago

*Membership:* J. R. Wallace, Chm., 31 Church St., Winchester, Mass.

*National Board of Dental Examiners:* William A. Dickson, Chm., Medical Arts Bldg., Minneapolis
Gerard J. Casey, Secy., 222 E. Superior St., Chicago

*Relief:* H. R. Bleier, Chm., 4177 N. Oakland Ave., Milwaukee
William O. Vopata, Secy., 1011 Lake St., Oak Park, Ill.

*Scientific Session:* Charles S. Kurz, Chm., 550 N. Eighth St., Carlyle, Ill.

SECTION CHAIRMEN

*Anesthesiology:* Harold W. Krogh, 1835 Eye St., N.W., Washington, D.C.

*Operative Dentistry:* Charles B. Murto, School of Dentistry, Georgetown University, Washington, D.C.

*Oral Surgery:* J. Lorenz Jones, 405 N. Bedford Dr., Beverly Hills, Calif.

*Orthodontics and Oral Development:* George A. Dinham, Medical Arts Bldg., Duluth, Minn.

*Pedodontics:* Ruth E. Martin, 4559 Scott Ave., St. Louis

*Periodontics:* Samuel C. Miller, 57 W. 57th St., New York

*Practice Administration:* Wallace N. Kirby, 935 Curtis St., Downers Grove, Ill.

*Prosthodontics, Complete:* Arthur L. Roberts, Aurora National Bank Bldg., Aurora, Ill.

*Prosthodontics, Partial:* Richard L. Simpson, Medical College of Virginia, Richmond, Va.

*Public Health Dentistry:* Polly Ayers, Box 2591, Jefferson County Board of Health, Birmingham, Ala.

*Research:* Reidar F. Sognnaes, 188 Longwood Ave., Boston

*Roentgenology:* Sam W. Williams, Marquette Bank Bldg., Minneapolis

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
*222 East Superior Street, Chicago 11, Illinois*
WHitehall 4-6730

LON W. MORREY, *Editor* JOHN J. HOLLISTER, *Business Manager*

All expressions of opinion and all statements of supposed fact are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association. Articles are accepted with the understanding that they have not been published previously and that they are submitted solely to The Journal. The Journal of the American Dental Association is indexed in the Index to Dental Literature, in the Current List of Medical Literature and, in part, in the Quarterly Cumulative Index Medicus, Biological Abstracts and Chemical Abstracts.

Advertising copy must conform to the official standards established by the American Dental Association. Notice of change of address should be received one month before the change is to be effective. Orders for reprints of Journal articles must be received by the Business Manager's office not later than the 15th of the month of issue in order to secure advantage of the lowest possible prices. Orders received after this date are subject to special quotation.

# *Announcements*

## MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

| | | |
|---|---|---|
| Ninety-Seventh Annual Session | Oct. 1-4, 1956 | Atlantic City, N. J. |
| Ninety-Eighth Annual Session | Nov. 4-7, 1957 | Miami, Fla. |
| Ninety-Ninth Annual Session | Nov. 10-13, 1958 | Dallas, Texas |
| One-Hundredth Annual Session | Sept. 21-24, 1959 | New York |

## MEETINGS OF CONSTITUENT SOCIETIES

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| **Alabama** | Apr. 15-17 | Biloxi, Miss. | F. A. Finney, Jr. | 1045 Forrest Ave., Gadsden |
| **Alaska** | Aug. 13-18 | Fairbanks | J. L. Irby | 1010 Noble St., Fairbanks |
| **Arizona** | Apr. 11-14 | Tucson | R. W. Christensen | 17 E. Weldon Ave., Phoenix |
| **Arkansas** | Apr. 8-11 | Little Rock | D. M. Hamm | Box 89, Clarksville |
| **California** | Apr. 23-25 | San Francisco | W. J. Healy | 450 Sutter St., San Francisco |
| **S. California** | Apr. 30-May 2 | Los Angeles | J. P. Bowers | 903 Crenshaw Blvd., Los Angeles 19 |
| **Colorado** | Oct. 21-24 | Colorado Springs | W. R. Humphrey | Republic Bldg., Denver |
| **Connecticut** | May 2-4 | Hartford | E. S. Arnold | 37 Linnard Rd., W. Hartford |
| **Delaware** | Jan. 1957 | | J. C. Gantt | 1102 Madison St., Wilmington |
| **District of Columbia** | Mar. 11-14 | Washington | J. F. Keaveny | 1029 Vermont Ave., N.W., Washington |
| **Florida** | May 28-30 | Miami Beach | W. A. Buhner | 167 Broadway, Daytona Beach |
| **Georgia** | Oct. 21-24 | Savannah | J. W. Yarbrough | Bibb Bldg., Macon |
| **Hawaii** | Sept. 10-15 | Maui Island | J. H. Dawe | 810 N. Vineyard St., Honolulu |
| **Idaho** | Sept. 27-29 | Sun Valley | D. E. Sonius | 125 Fourth Ave., N., Twin Falls |
| **Illinois** | May 14-16 | Springfield | P. W. Clopper | Jefferson Bldg., Peoria |
| **Indiana** | May 21-23 | Indianapolis | D. C. Barnhill | Bankers Trust Bldg., Indianapolis |
| **Iowa** | May 6-9 | Des Moines | H. I. Wilson | Insurance Exchange Bldg., Des Moines |
| **Kansas** | May 14-17 | Topeka | F. A. Richmond | Brotherhood Bldg., Kansas City |
| **Kentucky** | Apr. 8-11 | Louisville | A. B. Coxwell, Jr. | 1976 Douglass Blvd., Louisville |
| **Louisiana** | Apr. 11-14 | Alexandria | J. S. Bernhard | 2515 Line Ave., Shreveport |
| **Maine** | June 21-23 | Rockland | S. M. Gower | Box 27, Skowhegan |
| **Maryland** | May 7-9 | Baltimore | C. L. Inman, Jr. | Medical Arts Bldg., Baltimore |
| **Massachusetts** | May 6-9 | Boston | H. E. Tingley | 12 Bay State Rd., Boston |
| **Michigan** | Apr. 16-19 | Detroit | F. Wertheimer | Michigan Dept. of Health, Lansing |
| **Minnesota** | Apr. 23-25 | St. Paul | C. V. E. Cassel | Hamm Bldg., St. Paul |
| **Mississippi** | June 10-13 | Biloxi | B. A. Cohen | Plaza Bldg., Jackson |
| **Missouri** | May 6-9 | Jefferson City | E. D. Suggett | Merchants Bank Bldg., Jefferson City |
| **Montana** | May 3-6 | Helena | E. G. Vedova | Box 311, Roundup |
| **Nebraska** | Apr. 30-May 3 | Omaha | F. A. Pierson | Federal Securities Bldg., Lincoln |
| **Nevada** | May 7-9 | Las Vegas | O. M. Seifert | 506 Humboldt St., Reno |
| **New Hampshire** | June 24-27 | Rye Beach | F. E. Williams | 814 Elm St., Manchester |
| **New Jersey** | Apr. 23-25 | Atlantic City | J. G. Carr | 407 Cooper St., Camden |
| **New Mexico** | May 20-24 | Santa Fe | J. S. Ellar | Medical Arts Sq., N.E., Albuquerque |
| **New York** | May 14-16 | Syracuse | C. A. Wilkie | 1 Hanson Place, Brooklyn |
| **North Carolina** | May 13-16 | Pinehurst | R. D. Coffey | Box 270, Morganton |
| **North Dakota** | May 6-9 | Minot | J. H. Pfister | 419½ Dakota Ave., Wahpeton |
| **Ohio** | Oct. 28-31 | Columbus | E. G. Jones | 185 E. State St., Columbus |
| **Oklahoma** | Apr. 22-25 | Oklahoma City | S. A. Russman | Medical Arts Bldg., Oklahoma City |
| **Oregon** | Mar. 5-7 | Portland | T. D. Holder | Selling Bldg., Portland |
| **Panama Canal Zone** | Apr. 21 | | J. J. Dunne | 5700 Dispensary, Albrook Air Force Base |
| **Pennsylvania** | Apr. 19-21 | Harrisburg | M. D. Zimmerman | 217 State St., Harrisburg |
| **Puerto Rico** | | | M. A. Rosso | 409 Parque St., Santurce, San Juan |

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| **Rhode Island** | | | J. S. Allen | Union Trust Bldg., Providence |
| **South Carolina** | May 6-8 | Spartanburg | J. R. Owings | 7 Medical Court, Greenville |
| **South Dakota** | May 13-16 | Huron | R. E. Decker | Parker |
| **Tennessee** | Apr. 30-May 3 | Memphis | A. M. Ballentine | Pulaski |
| **Texas** | Apr. 29-May 2 | Fort Worth | W. Ogle | 3707 Gaston Ave., Dallas |
| **Utah** | May 17-19 | Salt Lake City | R. C. Dalgleish | State Capitol Bldg., Salt Lake City |
| **Vermont** | May 20-22 | Manchester | E. H. Van Santvoord | 128 Merchants Row, Rutland |
| **Virginia** | May 9-12 | Roanoke | W. T. McAfee | Colonial National Bank Bldg., Roanoke |
| **Washington** | Mar. 22-24 | Seattle | W. B. Martin | Medical-Dental Bldg., Seattle |
| **West Virginia** | July 22-25 | White Sulphur Springs | G. N. Casto, Jr. | 710½ Lee St., Charleston |
| **Wisconsin** | Apr. 9-11 | Milwaukee | A. E. Kopp | Wells Bldg., Milwaukee |
| **Wyoming** | June 14-16 | Cody | T J. Drew | State Office Bldg. ,Cheyenne |

## MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| **Alabama** | June 24-29*‡<br>June 25, 26†‡ | Birmingham | W. L. McCarty | Professional Center, Montgomery |
| **Alaska** | Aug. 7-10*<br>Aug. 7, 8† | Fairbanks | R. H. Williams | Box 2122, Juneau |
| **Arizona** | | | W. G. Biddulph | 1502 W. Osborn Rd., Phoenix |
| **Arkansas** | June 18-22 | Little Rock | W. T. Jones | 107 E. Shelton, Monticello |
| **California** | June 18<br>July 23 | Los Angeles<br>San Francisco | T. E. Tilden | Medico-Dental Bldg., Sacramento |
| **Colorado** | June 25-29 | Denver | J. M. Peabody | Republic Bldg., Denver |
| **Connecticut** | June 17-23*<br>June 17-23† | New York<br>Bridgeport | C. G. Brooks | 302 State St., New London |
| **Delaware** | | | P. K. Musselman | 143 W. Main St., Newark |
| **District of Columbia** | June 4-7, 9 | Washington | W. T. Birthright | 1835 Eye St., N.W., Washington |
| **Florida** | July 9-19*† | Jacksonville | A. W. Kellner | P. O. Box 155, Hollywood |
| **Georgia** | | | P. M. McNeil | First National Bank Bldg., Rome |
| **Hawaii** | | | H. L. Houvener | Dillingham Bldg., Honolulu |
| **Idaho** | | | A. G. DeWinter | Sun Bldg., Boise |
| **Illinois** | June 26-29‡<br>Nov. 27-30‡ | | W. A. McKee | Wood Bldg., Benton |
| **Indiana** | June 12-15*† | Indianapolis | C. A. Frech | Gary National Bank Bldg., Gary |
| **Iowa** | May 28-June 1*† | Iowa City | P. A. Hahn | Farmers & Merchants Bank Bldg., Burlington |
| **Kansas** | June 11-14‡ | | G. L. Teall | Box 71, Hiawatha |
| **Kentucky** | June 4-7*† | Louisville | J. J. Kelly | 102 W. Madison St., Franklin |
| **Louisiana** | June 3-8 | New Orleans | R. C. Steib | Maison Blanche Bldg., New Orleans |
| **Maine** | | | R. A. Derbyshire | Box 387, Skowhegan |
| **Maryland** | June 11-13‡ | | H. Levin | 3429 Park Heights Ave., Baltimore |
| **Massachusetts** | | | T. J. Glennon | 323 Main St., Woburn |
| **Michigan** | June 10-16 | Ann Arbor | J. L. Champagne | 3714 W. McNichols Rd., Detroit |
| **Minnesota** | June 11-15‡ | | M. G. Walls | 615 Montcalm Place, St. Paul |
| **Mississippi** | June 19-21‡ | | J. C. Boswell | Lamar Life Bldg., Jackson |
| **Missouri** | | | R. R. Rhoades | Central Trust Bldg., Jefferson City |
| **Montana** | | | R. O. Betzner | 303 Power Block, Helena |
| **Nebraska** | June 11-16 | Lincoln | H. E. Weber | Federal Securities Bldg., Lincoln |
| **Nevada** | June 25 | Reno | R. Whitehead | Masonic Temple, Reno |
| **New Hampshire** | June 21, 22*<br>June 21† | Boston | S. G. Markos | 8 Renaud Ave.,'Dover |
| **New Jersey** | June 25-28<br>June 29, 30 | Philadelphia<br>Trenton | W. A. Wilson | 150 E. State St., Trenton |
| **New Mexico** | June 18-23 | Santa Fe | J. J. Clarke, Sr. | Artesia |
| **New York** | June 21, 22, 26-29*‡<br>June 21, 22, 26, 27†‡<br>Oct. 10, 11, 16-19*‡<br>Oct. 10, 16, 17†‡ | | D. W. Beier | 23 S. Pearl St., Albany 7 |
| **North Carolina** | June 25‡ | Chapel Hill | J. H. Guion | Doctors Bldg., Charlotte 7 |
| **North Dakota** | July 9-13 | Fargo | T. M. Flath | Williston |
| **Ohio** | June 14-16, 18-20 | Columbus | H. B. Smith | 322 E. State St., Columbus |

| State | Date | Place | Secretary | Address |
|---|---|---|---|---|
| Oklahoma | June 18-20*† | Oklahoma City | W. E. Cole | First National Bldg., Oklahoma City |
| Oregon | June 4-7*† | Portland | F. L. Utter | Pioneer Trust Bldg., Salem |
| Pennsylvania | June 18-23*† | Philadelphia<br>Pittsburgh | A. M. Stinson | Dept. of Public Instruction, Box 911, Harrisburg |
| Puerto Rico | | | J. Mercado C. | Box 3717, Santurce |
| Rhode Island | | | F. M. Hackett | 267 Academy Ave., Providence |
| South Carolina | June 21-23 | Columbia | J. L. Gunter | 1226 Pickens St., Columbia |
| South Dakota | June 17-20 | Sioux Falls | H. T. Aker | Canton |
| Tennessee | June 11-15‡ | | C. R. Aita | Bennie Dillon Bldg., Nashville |
| Texas | June 10-16*<br>June 14-16† | Houston | R. T. Weber | Capital National Bank Bldg., Austin |
| Utah | | | G. W. Vogel | Eccles Bldg., Ogden |
| Vermont | June 25-27*† | Burlington | P. M. Fitch | Newport |
| Virginia | | | J. M. Hughes | Medical Arts Bldg., Richmond |
| Washington | June 18-21 | Seattle | M. L. Mower | National Bank of Commerce Bldg., Olympia |
| West Virginia | June 25-27*† | West Liberty | J. B. Davis | Goff Bldg., Clarksburg |
| Wisconsin | June 4-8*† | Milwaukee | S. F. Donovan | Tomah |
| Wyoming | | | W. A. Hocker | O & S Bldg., Casper |

Most states require applications to be in 30 days prior to examination date.
*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations. §Approximate dates—verify with state dental examining board.

## MEETINGS OF OTHER ORGANIZATIONS

| Name | Date | Place | Secy. or Chm. | Address |
|---|---|---|---|---|
| Academy of Denture Prosthetics | Apr. 29-May 6 | Colorado Springs | I. L. Furnas<br>Secy. | 928 Silverado St.,<br>La Jolla, Calif. |
| American Academy of Dental Medicine | June 21-24 | Detroit | G. J. Witkin<br>Secy. | 45 S. Broadway,<br>Yonkers, N.Y. |
| American Academy of Pedodontics | June 11-15 | Milwaukee | E. C. Schildwachter<br>Secy. | 6831 Seville Ave.,<br>Huntington Park, Calif. |
| American Association of Dental Schools | Mar. 25-28 | St. Louis | M. W. McCrea<br>Secy. | Baltimore College of Dental Surgery,<br>Dental School,<br>University of Maryland,<br>Baltimore 1 |
| American Association of Industrial Dentists | Apr. 24-26 | Philadelphia | E. R. Aston<br>Secy. | South Office Bldg.,<br>Harrisburg, Pa. |
| American Association of Orthodontists | Apr. 29-May 3 | Boston | F. A. Squires<br>Secy. | Medical Centre,<br>White Plains, N.Y. |
| American Board of Dental Public Health | Sept. 27, 28 | Atlantic City, N.J. | P. E. Blackerby, Jr.<br>Secy. | 250 Champion St.,<br>Battle Creek, Mich. |
| American Board of Oral Surgery | Apr. 7-10 | Chicago | L. M. FitzGerald<br>Secy. | Roshek Bldg.,<br>Dubuque, Iowa |
| American Dental Society of Europe | July 10-13 | London, England | J. P. Molony<br>Hon. Secy. | 110 Harley St.,<br>London W.1, England |
| American Society of Dentistry for Children | Sept. 28-30 | Atlantic City, N.J. | H. C. Hester<br>Pub. Chm. | Arcade Bldg.,<br>Glen Ridge, N.J. |
| British Dental Association | June 25-29 | Brighton, Sussex, England | H. P. Buchanan<br>Secy. | 13 Hill St.,<br>Berkeley Sq.,<br>London, England |
| Canadian Dental Association | June 3-6 | Banff, Canada | R. L. Rasmussen | Greyhound Bldg.,<br>Calgary, Alberta, Canada |
| Chicago Dental Society | | Chicago | K. S. Richardson<br>Exec. Secy. | 30 N. Michigan Ave.,<br>Chicago |
| Council on Dental Education, Dental Aptitude Tests | Apr. 27, 28 | | S. Peterson<br>Secy. | 222 E. Superior St.,<br>Chicago |
| Federation Dentaire Internationale | May 28-June 3 | Zurich, Switzerland | G. H. Leatherman<br>Secy. Gen. | 35 Devonshire Place,<br>London, England |
| Fourteenth Australian Dental Congress | Mar. 5-9 | Melbourne, Australia | H. R. Cash<br>Pres. | 49 Mathoura Rd.,<br>Toorak, Australia |
| International Association for Dental Research | Mar. 22-25 | St. Louis | D. Y. Burrill<br>Asst. Secy. | 129 E. Broadway,<br>Louisville 2, Ky. |
| Maritime Dental Association Convention | June 27-29 | Halifax, Nova Scotia | E. F. Dexter<br>Secy. | 5 Dutch Village Rd.,<br>Halifax, Nova Scotia |
| National Board of Dental Examiners | Apr. 2, 3 | | G. J. Casey<br>Secy. | 222 E. Superior St.,<br>Chicago |

| Name | Date | Place | Secy. or Chm. | Address |
|---|---|---|---|---|
| **Northeastern Dental Society** | June 3-6 | Swampscott, Mass. | M. J. Frasca Secy. | 153 Cabot St., Beverly, Mass. |
| **Northwest Conference in Dental Medicine, Twelfth Annual Conference** | May 13-17 | Victoria, B.C., Canada | G. Underwood Secy. | Selling Bldg., Portland, Ore. |
| **Seventh Annual Berkshire Conference** | June 17-21 | Lenox, Mass. | I. Glickman Dir. | Tufts University, School of Dental Medicine, 136 Harrison Ave., Boston |
| **Southeastern Academy of Prosthodontics** | Mar. 17, 18 | Atlanta, Ga. | W. A. Hall, Jr. Secy. | Loyola University, P. O. Box 115, New Orleans |
| **Southern Academy of Periodontology** | Apr. 29-May 1 | St. Petersburg, Fla. | W. Mayo Secy. | Brent Annex, Pensacola, Fla. |
| **Southern Society of Orthodontists** | Aug. 19-22 | White Sulphur Springs, W.Va. | M. D. Edwards Secy. | 132 Adams Ave., Montgomery, Ala. |
| **Thirteenth German Dental Meeting** | Aug. 20-26 | Munich, Germany | F. H. Witt | Universitaetsstrasse 73, Cologne-Lindenthal, Germany |
| **Thomas P. Hinman Mid-Winter Clinic** | Mar. 18-21 | Atlanta, Ga. | D. H. Simpson Gen. Chm. | Medical Arts Bldg., Atlanta, Ga. |
| **Western Society of Periodontology** | Mar. 16-18 | Las Vegas, Nev. | A. Ariaudo Gen. Chm. | Bank of America Bldg., San Diego, Calif. |

# INDEX TO ADVERTISEMENTS

## March 1956


American Bakers Association.....A-31
American Dental Association
Are You Moving?.....A-30
Dental Abstracts.....A-33
Dental Aptitude Tests.....A-22, A-23
Dues.....A-28
National Board Examinations.....A-52
American Ferment Company.....A-13
Amurol Products Co.....A-7, A-53
Ash, Sons & Company, Claudius.....A-55
Astra Pharmaceutical.....Insert
Austenal Laboratories, Inc..A-50, A-51, A-65

Baker & Company.....A-67
Bristol-Myers Co.....3rd Cover

Castle Co., Wilmot.....A-49
Caulk, Co., L. D.....A-38, A-39
Church & Dwight Co., Inc.....A-61
Classified Advertising.....A-34, A-35, A-36
Coe Laboratories, Inc.....A-8
Columbia Dentoform Corp.....A-45
Columbus Dental Mfg. Co.....A-20
Colwell Publishing Co.....A-30
Cook-Waite Laboratories, Inc.....A-2, A-3
Corega Chemical Co.....A-15
Crescent Dental Mfg. Co.....A-12

Dentists' Supply Co., of New York..4th Cover

Exakta Camera Co.....A-32

Florida Citrus Commission.....A-40
Foredom Electric Company.....A-19

Gesner, Inc., M. A.....A-48
Gomco Surgical Mfg. Corp.....A-46

Hammond Organ.....A-7
Hudson Products.....A-14

Invincible Metal Furniture Co.....A-32

Jectron Company.....A-29
Jelenko & Co., J. F.....A-1
Johnson & Johnson.....A-16

Kerr Manufacturing Co.....A-66

Lactona, Inc.....A-24
Lauer Metal Shop.....A-36
Lederle Laboratories.....A-47
Lippincott Co., J. B.....A-58, A-59
Luxene, Inc.....Insert

National Apple Institute.....A-54
Ney Co., The J. M.....A-41
Novocol Chemical Mfg. Co.....A-44
Nu-Dent Porcelain Studio, Inc.....A-5

Odontographic Mfg. Co., Inc.....A-43
Oral B Company.....A-62

Pelton & Crane Co.....A-21
Permadent Products.....A-25
Pfingst & Co., Inc.....A-42
Pfizer & Co., Inc., Chas.....A-6
Physicians Casualty & Health Assn.....A-53
Professional Budget Plan.....A-64

Quaker Oats Company.....A-26

Ralph & Swartz, Realtors.....A-32
Ransom & Randolph Co.....A-9
Rinn X-Ray Products, Inc.....A-68
Ritter Co., Inc.....2nd Cover
Rockmont Envelope Co.....A-18

Saunders Co., W. B.....A-63
Squibb & Sons, E. R., Division of
Mathieson Chemical Corp.....A-37
Stocker & Yale, Inc.....A-28

Ticonium.....A-4
2-K Research Laboratories.....A-18

Union Broach Co., Inc.....A-30

Weber Dental Mfg. Co.....A-60
Wernet Dental Mfg. Co., Inc.....A-10, A-11
Whip-Mix Corp.....A-14
White Dental Mfg. Co.,
The S. S.....A-56, A-57
Williams Gold Refining Co., Inc.....A-27

*Speed up Collections!*

*Reduce...*

**BILLING COSTS**

★ If monthly billing is an expensive time-consuming headache—

★ If you'd like to speed up collections without offending patients

**FREE** samples of Rockmont Statement Envelopes and Collectelopes are yours. Simply clip coupon below and mail for FREE samples. Doctors everywhere say they save more than they cost. Sold on money-back guarantee.

**FREE** Personalized Stamp Pad Kit for endorsing checks, etc., with your name and address, with initial order. We'll send details.

**ROCKMONT ENVELOPE COMPANY**
198 W. Alameda Ave., Denver 9, Colo.

*Mail* samples of your Statement Envelopes and Collectelopes, and details of your FREE stamp pad offer.

Signed_____

JAD-1

FOR
BETTER-FIT, BUBBLE-FREE
**INLAYS**
USE THE
**NEW VAC-U-VESTOR**
*lighter in weight . . . more compact*

activates the famous
**VAC-U-SPAT INVESTOR**
for vacuum investing

**WHIP-MIX CORPORATION**
LOUISVILLE 8, KENUCKY

**THE 2-K* WEDGE**

The Interdental Wedge
Acclaimed by Dentists . . .
*Everywhere!*

Pat. Pend.

★ IT'S A TIME SAVER
★ IT'S ADAPTABLE
★ IT'S ECONOMICAL

In only a second the dentist has the perfect anatomically adapted wedge that has compressibility . . . swells with moisture, yet has ideal stiffness. Sufficient stock for more than 180 wedges **ONLY $1.50** . . . Available at leading dental supply houses.

*Reg. Pend.

**2-K RESEARCH LABORATORIES**
ANAHEIM, CALIFORNIA

Pays for Itself on AWAY-FROM-THE-CHAIR-TASKS

Budget Priced
ALLCORD ENGINE
by Foredom

The prized possession of thousands of dentists and dental students!

Only $44.50
with Doriot handpiece $67.25

Precision-made Arm

Reversible

6-speed Foot Rheostat

So extremely LOW PRICED, this model makes it possible for any dentist or dental student to acquire a cord engine for AWAY-FROM-THE-CHAIR tasks, emergency duty and laboratory needs. It weighs only 10 lbs. and, compactly constructed, it's easy to carry about or stow away. ONE OF A COMPLETE LINE SOLD BY LEADING DEALERS.

Built to Foredom's Well Known Quality Standards—World Recognized For Over Three Decades

NEW! HIGH SPEED DORIOT HANDPIECE
ONLY $67.00 speeds up to 20,000 RPM

MODEL 21

SINCE 1922 SERVICE DEPENDABILITY

WRITE FOR COMPLETE NEW CATALOG NO.D28C

Foredom ELECTRIC COMPANY
27 PARK PLACE, Dept. D28C NEW YORK 7, N.Y.

Teeth esthetically suitable for metal restorations require an anatomy different from the traditional denture-tooth anatomy with its wide interstitial spaces and marked collar line.

Steele's New Hue facings provide modern esthetics for restorations of metal—even to that lifelike sparkle; and the ultimate in esthetics is obtained with Steele's Porcelain Biting-Edge facings.

Steele's

THE COLUMBUS DENTAL
MANUFACTURING COMPANY
COLUMBUS 6, OHIO

$30.00
trade-in allowance on your old light toward the new

PELTON LIGHT
(offer extended to March 31)

The new Pelton Light is the biggest improvement in oral illumination in years—it provides a cool, color-corrected beam for maximum patient comfort and operating ease. All parts of the oral cavity are flooded with the correct intensity, regardless of operating position. Two converging beams, filtered through Aklo glass steps, eliminate complete glare, shadows and any form of light blockage. Easy-to-clean finish in white, black and silverlux. Other colors slightly higher.

a long-time investment in better seeing
$185.00
(at factory)

YOUR DEALER HAS IT NOW!

the Pelton & Crane company
CHARLOTTE 3, NORTH CAROLINA
*Fine Professional Equipment Since 1900*

announces the

# Dental Aptitude Test

for admission to 1956 Dental School Classes
will be given on

**APRIL 27-28, 1956**
*(application must be received by April 13)*

Sponsored by Council on Dental Education of the American Dental Association

Applicants should contact any of the dental schools listed for copies of the brochure, THE 1956 DENTAL APTITUDE TESTING PROGRAM, and for application blanks to take the tests.

## Dental schools

**ALABAMA**
School of Dentistry
University of Alabama
1919 7th Avenue, South
Birmingham 5, Alabama

**CALIFORNIA**
School of Dentistry
College of Physicians and Surgeons
344 Fourteenth Street
San Francisco 3, California

College of Dentistry
University of California
University Medical Center
San Francisco 22, California

School of Dentistry
University of Southern California
925 West Thirty-fourth Street
Los Angeles 7, California

School of Dentistry
College of Medical Evangelists
Loma Linda, California

**DIST. OF COLUMBIA**
School of Dentistry
Georgetown University
3900 Reservoir Road, N.W.
Washington 7, D. C.

College of Dentistry
Howard University
500 W. Street, N. W.
Washington 1, D. C.

**GEORGIA**
School of Dentistry
Atlanta-Southern Dental College
Emory University
106 Forrest Avenue, N.E.
Atlanta 3, Georgia

**ILLINOIS**
Chicago College of Dental Surgery
Loyola University
1757 West Harrison Street
Chicago 12, Illinois

The Dental School
Northwestern University
311 East Chicago Avenue
Chicago 11, Illinois

College of Dentistry
University of Illinois
808 South Wood Street
Chicago 12, Illinois

**INDIANA**
School of Dentistry
Indiana University
1121 West Michigan Street
Indianapolis 2, Indiana

**IOWA**
College of Dentistry
State University of Iowa
Dental Building
Iowa City, Iowa

**KENTUCKY**
School of Dentistry
University of Louisville
129 East Broadway
Louisville 2, Kentucky

**LOUISIANA**
School of Dentistry
Loyola University
6363 St. Charles Avenue
New Orleans 18, Louisiana

**MARYLAND**
Baltimore College of Dental Surgery
The Dental School
University of Maryland
618 West Lombard Street
Baltimore 1, Maryland

**MASSACHUSETTS**
Harvard School of Dental Medicine
25 Shattuck Street
Boston 15, Massachusetts

School of Dental Medicine
Tufts University
136 Harrison Avenue
Boston 11, Massachusetts

**MICHIGAN**
School of Dentistry
University of Detroit
630 East Jefferson Avenue
Detroit 26, Michigan

School of Dentistry
University of Michigan
Ann Arbor, Michigan

**MINNESOTA**
School of Dentistry
University of Minnesota
Washington Ave. and Union St., S.E.
Minneapolis 14, Minnesota

**MISSOURI**
Kansas City-Western Dental College
School of Dentistry
The University of Kansas City
1108 East Tenth Street
Kansas City 6, Missouri

School of Dentistry
St. Louis University
3556 Caroline Street
St. Louis 4, Missouri

School of Dentistry
Washington University
4559 Scott Avenue
St. Louis 10, Missouri

**NEBRASKA**
School of Dentistry
The Creighton University
26th and California Streets
Omaha 2, Nebraska

College of Dentistry
University of Nebraska
Lincoln 8, Nebraska

**NEW JERSEY**
The Dental School
Fairleigh Dickinson College
Teaneck, New Jersey

College of Dentistry
Seton Hall University
Jersey City Medical Center
Jersey City, New Jersey

**NEW YORK**
School of Dental and Oral Surgery
Columbia University
630 West 168th Street
New York 32, New York

College of Dentistry
New York University
209 East Twenty-third Street
New York 10, New York

School of Dentistry
University of Buffalo
3435 Main Street
Buffalo 14, New York

**NORTH CAROLINA**
School of Dentistry
The University of North Carolina
Chapel Hill, North Carolina

**OHIO**
College of Dentistry
The Ohio State University
Columbus 10, Ohio

School of Dentistry
Western Reserve University
2165 Adelbert Road
Cleveland 6, Ohio

**OREGON**
The Dental School
University of Oregon
809 Northeast Sixth Avenue
Portland 14, Oregon

**PENNSYLVANIA**
School of Dentistry
Temple University
3223 North Broad Street
Philadelphia 40, Pennsylvania

Thomas W. Evans Museum & Dental
Institute School of Dentistry
University of Pennsylvania
4001 Spruce Street
Philadelphia 4, Pennsylvania

School of Dentistry
University of Pittsburgh
Thackeray and O'Hara Streets
Pittsburgh 13, Pennsylvania

**TENNESSEE**
School of Dentistry
Meharry Medical College
Nashville 8, Tennessee

College of Dentistry
University of Tennessee
847 Monroe Avenue
Memphis 3, Tennessee

**TEXAS**
College of Dentistry
Baylor University
800 Hall Street
Dallas 10, Texas

School of Dentistry
University of Texas
6516 Freeman Ave.
Houston, Texas

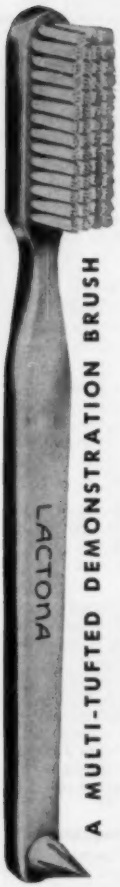
**VIRGINIA**
School of Dentistry
Medical College of Virginia
12th and Clay Streets
Richmond 19, Virginia

**WASHINGTON**
School of Dentistry
University of Washington
Health Sciences Building
Seattle 5, Washington

**WEST VIRGINIA**
School of Dentistry
West Virginia University
Morgantown, West Virginia

**WISCONSIN**
School of Dentistry
Marquette University
604 North Sixteenth Street
Milwaukee 3, Wisconsin

The dental aptitude tests are administered in 46 other colleges and universities including Hawaii, Puerto Rico and Europe.

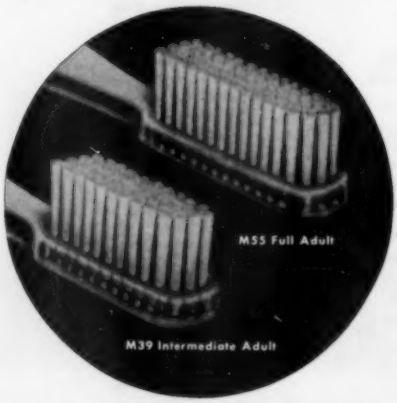



# *Lactona*

## 'Tooth-Tip' TOOTHBRUSHES

Multi-Tufted—2 Row, 12 Knots—3 Row, 18 Knots
A *COMPLETE* Line—A *CHOICE* of Brush Styles and Textures with Natural Bristle or TYNEX (nylon).

**A New Multi-Tufted Brush in a Special Soft Texture *Genuine Natural Bristle.***




Lactona is *First* with Multi-Tufted Adult Brushes stapled with Soft, *Genuine Natural Bristle*. This brush has definite advantages. A Soft Natural Bristled brush 'takes hold' on a smooth surface and exerts a superior cleansing and stimulating action.

**Double Size enlarged (2 diameters)**

•

**All plastic handle**

•

**Perfectly trimmed and finished**

•

**A visual aid for patient instruction**

*Please use coupon to request circular describing special offer of Multi-Tufted Adult brushes — any texture Natural Bristle or Tynex (nylon), with **FREE** Demonstration brush.*

LACTONA INCORPORATED Saint Paul 1, Minn.

Gentlemen: Please send circular describing special offer of Multi-Tufted Demonstration brush.

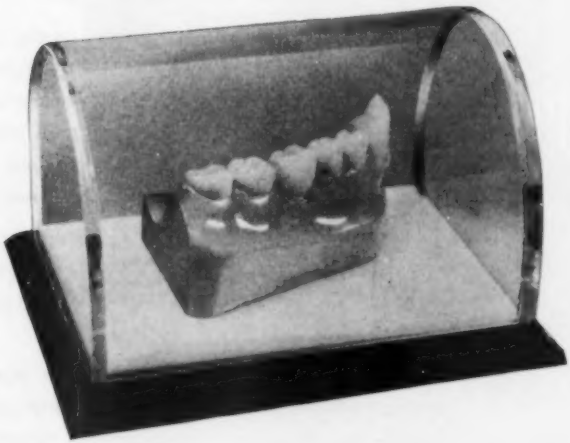
Doctor_____

Address_____

City_____ Zone____ State_____

# Permadent Display Cases Assure Bridgework Contracts!

- Show your patients you can give them PERMANENT PORCELAIN instead of ordinary gold bridgework — at moderate cost. Help them visualize PERMADENT: The beauty and health of porcelain on ALL surfaces, including the ridge—combined with the strength and perfect fit imparted by the precious metal bonded to it underneath.



## PREVIEWS OF SATISFACTION FOR PATIENTS

*At Left:* Display Case #2, a 3-unit posterior bridge on pink acrylic model with matched porcelain teeth, shown as packaged in its attractive lucite box.

Display Case #1 *(not shown)* is a 4-unit anterior.

Display case #3 *(not shown)* features gold inlays connected to Permadent porcelain pontics.

Other types are available.

## LOW COST PERMADENT DISPLAY CASES BUILD PRACTICES

*Contact us for prices, description of other types of Display Cases and information on processing of Permadent restorations.*

PERMADENT PRODUCTS
1780 Broadway, New York 19, N. Y.

# Oatmeal

## in the light of Current Nutritional Knowledge

Present nutritional knowledge, greatly advanced during the past two decades, again enhances the time-honored position of this widely eaten breakfast dish—rolled oats with milk and sugar.

The protein content of oatmeal, unaffected by processing or preparation for the table, is higher than that of other commonly eaten whole-grain cereals. The protein of the oatmeal and milk serving is of high biologic value. The carbohydrate is readily digested and available for energy needs.

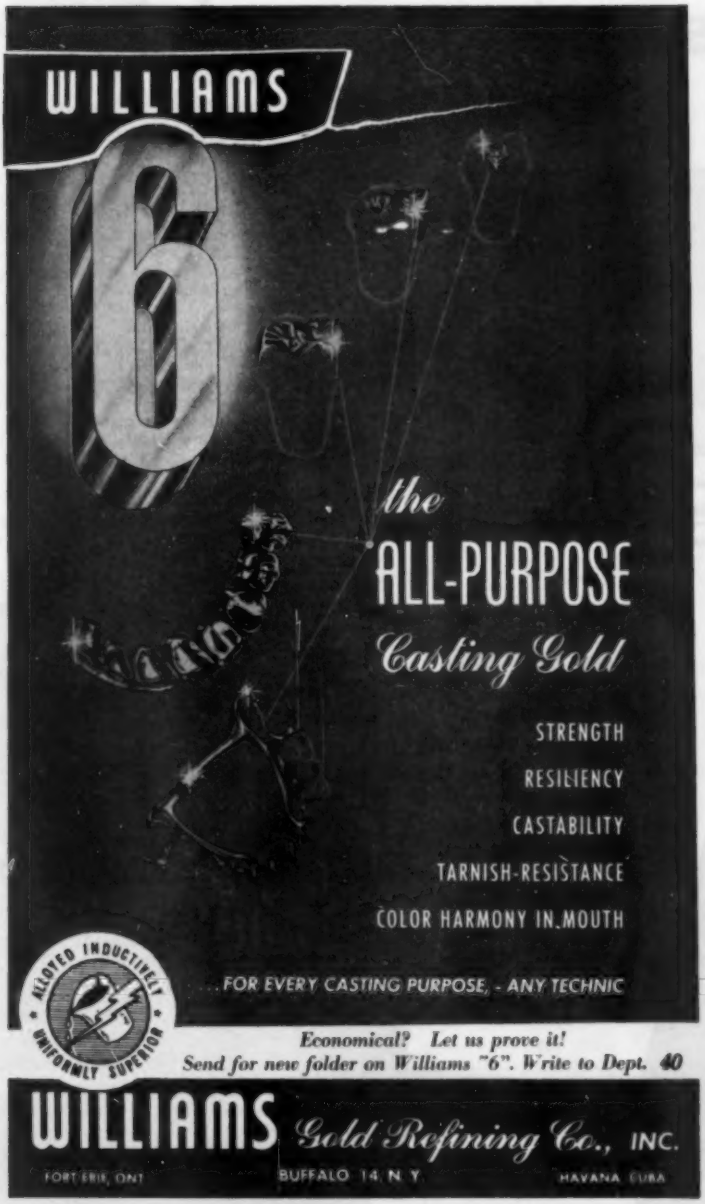
Among whole-grain cereal foods, oatmeal ranks among the highest in thiamine. It also contributes notable amounts of other B-complex vitamins.

For mineral content, too, oatmeal is rated among the leaders. It is outstanding for iron and phosphorus. Because of its low sodium content, it is particularly well suited for sodium-restricted diets.

The low cost of Quaker Oats and Mother's Oats, their delicious nutlike flavor, assured by careful selection of the oats used, together with their high nutrient value, warrant the continued recommendation of oatmeal as a key dish of America's breakfast.

Quaker Oats and Mother's Oats, the two brands of oatmeal offered by The Quaker Oats Company, are identical. Both brands are available in the Quick (cooks in one minute) and the Old-Fashioned (cooks in 5 minutes) varieties which are of equal nutrient value.

The Quaker Oats Company
CHICAGO

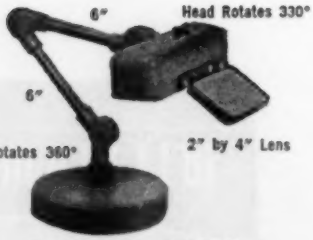



*Economical? Let us prove it!*
*Send for new folder on Williams "6". Write to Dept. 40*

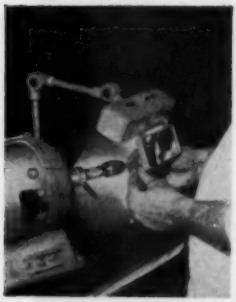
WILLIAMS *Gold Refining Co., INC.*

FORT ERIE, ONT. BUFFALO 14, N. Y. HAVANA, CUBA

**SEE** ...more... ...better... ...clearer...




Heavy Cast Base — Will Not Topple



*Lite-Mite's* good, clean, cool fluorescent illumination is high intensity. Thorough, accurate magnifying lens. Correct power, flawless quality assures detail and color perfection. Dentists, laboratory technicians enjoy greater SEE-ABILITY. Heavy base, rotating arms gives you an extra pair of hands.

Working in larger scale under illuminated magnification assures better values. Fitting, finishing, burring and polishing castings to patterns — master models saves valuable time and expense. Scratches — burrs detected and removed.

Used by industry, hospitals, laboratories and in crime detection. Send for Free illustrated brochure or mail your check or Postal Money Order direct for $29.50 Parcel Post Paid. Unconditionally guaranteed.

**Stocker & Yale** INCORPORATED 77 GREEN STREET MARBLEHEAD, MASS.

---

**unless**

your 1956 dues have been paid this is the LAST ISSUE of the Journal we can send you...

**SO,** if you haven't yet paid your 1956 dues, please do so immediately. Once off the mailing list it takes time to restore a name. Act quickly to avoid disappointment. Keep your Journal coming without interruption.

MOIST or DRY

# JECTRON

POLYSTYRENE DENTURES

## never shrink, warp or water-swell!

DOW

Created through
cooperative research by
THE DOW CHEMICAL COMPANY
and the
JECTRON COMPANY

Ordinary denture resins shrink or swell when they absorb or lose water. Only JECTRON polystyrene resin is immune to these damaging changes of form. That is just one of many reasons why JECTRON dentures fit better, far longer, than any other.

### FREE BOOKLET SHOWS REASONS WHY JECTRON FITS BETTER

For the complete, eye-opening Jectron story, ask your laboratory for the 20-page illustrated report entitled "Jectron —key to a more successful denture service." Or write "Jectron Report" on your card or letterhead and mail direct to Jectron Company, 1009 Jackson Street, Toledo 1, Ohio.

*Jectron is not an acrylic . . . it is pre-cured polystyrene specially compounded for dentures*

# COLWELL

*Companions to a Successful Practice...*

**SAVE on Professional Stationery!**

Modern printing methods and volume production offer you worthwhile savings on Colwell's complete line of:

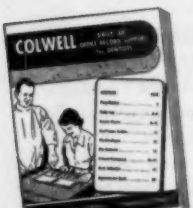
- LETTERHEADS
- ENVELOPES
- BILLHEADS
- STATEMENTS
- APPOINTMENT and PROFESSIONAL CARDS

Accurate, clean-cut letterpress work on highest quality materials. Satisfaction guaranteed.

The DAILY LOG Record Book
APPOINTMENT LOG · STATIONERY
PATIENTS' RECORDS · FILING DEVICES

COLWELL

All Your Professional Stationery and Record Supplies from One Dependable Source!




**Send for FREE Catalog!**

COLWELL
Publishing Co.
262 University Ave.
Champaign, Ill.

Please send me your new 1956 Dental Record Supplies Catalog.

Dr. .....

Address .....

City..... State.....



# are you MOVING ?

Giving us advance notice will keep the Journal coming to you without interruption. Here's a handy form to use:

Name .....

Old Address .....

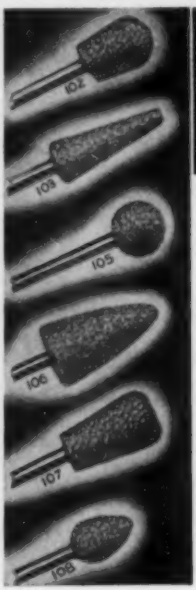
.....

New Address .....

.....

Mail to American Dental Association, 222 E. Superior St., Chicago 11, Illinois.






Indian Head
TUNGSTEN CARBIDE
Acrylic & Metal Trimmers

- Ideal for Acrylics —will not adhere, heat or clog
- for Steel and Gold Cases — will cut and leave polished surfaces
- Excellent for Trimming Base Plates
- Will not chip Porcelain Teeth

*FASTER CUTTING*
*CLEANER CUTTING*

"The Trimmer with Universal Use"

**$3.75** each

UNION BROACH CO., INC.
37 West 20th St.
New York 11, N.Y.

# The Role of Enriched Bread in Sound Nutrition

**Is bread cariogenic?**

A scientifically valid answer has recently been expressed by the Council on Dental Health and the Council on Dental Therapeutics of the American Dental Association:

**"Available evidence indicates that starchy carbohydrates are of minor importance in the process of caries since complex carbohydrates cannot diffuse into bacterial plaques and cannot be degraded promptly to simple sugars in most mouths."**[1]

The complex carbohydrate of enriched white bread thus does not appear to be a contributing factor to caries.

Limited dental observations[2] for 10 months on 101 German orphanage children fed diets providing 75 per cent of their calories in the forms of enriched and unenriched white breads and whole wheat bread are not inconsistent with this view.

In addition, "One of the most striking findings...and perhaps the most unexpected one, was the remarkable way in which the general condition of all the children...improved...[The diets fed] provided undernourished children aged 5-15 years with all the nutrients required for a high rate of growth and development for a period of 18 months."[2]

**Enriched bread owes its high nutritional value to its contained protein (39 grams per pound loaf), B vitamins, iron, calcium, and nutrient energy. On the average its commercial formula includes nonfat milk solids, 4 grams per 100 grams of flour. The protein of such enriched bread, consisting of flour protein supplemented by milk and yeast proteins, supports both good growth and maintenance of tissues.**

1. Joint Report of the Council on Dental Health and the Council on Dental Therapeutics of the American Dental Association: Sugar and Dental Caries: The Effect on the Teeth of Sweetened Beverages and Other Sugar-Containing Substances, J. Am. Dent. A. 47:387 (Oct.) 1953.

2. Widdowson, E. M., and McCance, R. A.: Studies on the Nutritive Value of Bread and on the Effect of Variations in the Extraction Rate of Flour on the Growth of Undernourished Children, Medical Research Council, Special Report Series, No. 287, London, Her Majesty's Stationery Office, 1954.

**AMERICAN BAKERS ASSOCIATION**
20 North Wacker Drive • Chicago 6, Illinois

The nutritional statements made in this advertisement have been reviewed by the Council on Foods and Nutrition of the American Medical Association and found consistent with current authoritative medical opinion.

NOW . . . . . FOR PARALLAX-FREE DENTAL PHOTOGRAPHY

The premature loss of the second deciduous molar caused the mesial shift of the first permanent molar. This in turn locked out the second bicuspid which erupted later. Taken with Automatic Exakta VX

**AUTOMATIC EXAKTA VX**

35-MM. SINGLE LENS REFLEX CAMERA
WITH f/2.0 AUTOMATIC ZEISS BIOTAR LENS

For easily made dental photograpns and faithfully reproduced oral conditions—facilitating case recording in oral pathology, surgery, orthodontics and full mouth rehabilitation . . . an invaluable aid in patient education. New AUTOMATIC Lens, when fully stopped down, permits focusing and viewing without annoying the patient with modeling lights. In addition, you can use the Exakta for personal photography, sports portraits, copywork, etc.

*FREE!* — Write Dept. 2uz for Free Descriptive Booklet "B" on Camera & Accessories and Brochure on Close-Up Technique with Automatic Exakta VX

**EXAKTA CAMERA COMPANY**
705 Bronx River Road, Bronxville 8, New York

Smart
**Invincible desk**
with concealed safe unit

Invincible's latest Modernaire desk combines handsome style with built-in safety for valuable papers, records, narcotics, drugs. Concealed safe unit keeps all under locked steel protection.

*File them safely too* — Concealed safe unit also in Invincible files of desk-high, counter-high or four-drawer size. Legal or letter size. Optional general lock.

*See your dealer or write*

**INVINCIBLE**
INVINCIBLE METAL FURNITURE COMPANY
Manitowoc, Wisconsin

**EXCELLENT OPPORTUNITY FOR ORAL SURGEON**

Combination residence, office and operating suite of 9 rooms. Excellent location in Plainfield, New Jersey close to business district and hospital. Residence area consists of 3 bedrooms, two baths, living room, dining room and kitchen. Two car garage. Lot 50x200. Offered at $38,000, far below cost of reproduction. Additional 50 feet adjoining available for $7,000. Attractive terms.

RALPH & CALVIN SCHWARTZ, REALTORS · PLAINFIELD, N.J. · PHONE PLAINFIELD 4-7575

# THE AMERICAN DENTAL ASSOCIATION

Announces a new publication

# DENTAL ABSTRACTS

published monthly at the low annual subscription price of $6.00 for U. S. subscriptions; foreign $7.00. First issue, January, 1956.

DENTAL ABSTRACTS has a dual purpose: (1) to provide, by a few hours' reading each month, a survey of the significant advances being made by dentistry throughout the world, as reflected in current dental literature; and (2) to supply enough data in each abstract so that the reader may be encouraged to refer to the original article for more complete information.

DENTAL ABSTRACTS enables every dentist to keep informed on dental progress everywhere. It is particularly helpful to those—general practitioners, researchers, educators, technicians and manufacturers, to mention a few—who require a knowledge of more than one field in dentistry. All find DENTAL ABSTRACTS the answer to a long felt need.

For easy reference DENTAL ABSTRACTS is divided into these eight major sections:

Preventive and Public Health Dentistry
Basic Science
Periodontics and Endodontics
Operative Dentistry
Prosthetic Dentistry
Oral Surgery
Orthodontics
Professional Activities

The entire dental literature is covered under these eight heads. Send in your order and check today. The convenient order form below is for your use.

**AMERICAN DENTAL ASSOCIATION, Subscription Dept.**
**222 East Superior Street, Chicago 11, Illinois**

Please enter my subscription to DENTAL ABSTRACTS for 1 year. My check is enclosed.*

*please type or print*

Name .....

Address .....

City, zone & state .....

*Subscriptions: $6 for U. S.; foreign $7.00.

# CLASSIFIED ADVERTISING

Forms close on 25th of second month preceding month of issue

**Remittance Must Accompany Classified Ads.**

Classified advertising rates are as follows:
30 words or less—per insertion.....$4.00
Additional words, each..... .10
Answers sent c/o American Dental Association.....no extra charge
Replies to A.D.A. box number ads should be addressed as follows:
American Dental Association
222 E. Superior Street
Chicago 11, Ill. Box.....
**Please be sure that the box number appears on the envelope.**

## PRACTICES AND OFFICES FOR SALE AND RENT

CALIFORNIA—For sale. Fresno. Long established, successful general practice; centrally located, modern equipment. Ten thousand patients' cards. Terms. Recalled into service. Address A.D.A. Box No. 257.

•

CALIFORNIA—For sale. Oral surgery practice and equipment at inventory. This is a beautifully situated office in southern California; outstanding location. Takes well qualified man to handle. Address A.D.A. Box No. 232.

•

COLORADO—For sale. Long established lucrative practice. Modern, fully equipped, ground floor office. Low overhead. Ideally located near east central Colorado. Booming county seat town, about 5,000. Colleges near. Three-bedroom home optional. Available about June. Address A.D.A. Box No. 264.

•

COLORADO—For sale. Active practice in growing college town. Fully equipped two-chair office. Street floor location. Will sell for inventory, about $3,500. May arrange terms. Address A.D.A. Box No. 235.

•

FLORIDA—Modern, fully equipped, air-conditioned bungalow office. Well established, near Daytona Beach. Excellent opportunity for right person. Reason for selling, retiring. Address A.D.A. Box No. 227.

•

FLORIDA—For sale. Well established general practice and equipment in choice Florida west coast location. Dentist to specialize. This practice available June 1, 1956. Prefer to introduce well-qualified man to patients for at least four weeks before leaving. Address A.D.A. Box No. 266.

•

FLORIDA—Two-chair dental office located heart of business district in rapidly growing east coast town. Only two dentists practicing in area of 15,000 population. Facilities include waiting room, office, laboratory, x-ray and dark room. Contact Box 686, New Smyrna Beach.

•

FLORIDA—For sale. General practice, established 24 years. Located in rapidly expanding northeast Florida community of 12,000. Hub of four highways, one federal. Manufacturing, cattle, farming, timber and tourists. New $400,000 hospital. Expansion in last year: 3½ million dollars industrial, $750,000 municipal, $450,000 school. Excellent opportunity for general practitioner. Retiring. Address A.D.A. Box No. 263.

•

ILLINOIS—For sale. Completely equipped offices, including good-will of 30 years. Dentist deceased. Julius Hirshfeld, 30 Main, Champaign.

INDIANA—For sale, with or without large practice, ultramodern air-conditioned office in city of 50,000, which is growing. City has largest income per capita by 42% in U.S.A. Home of Purdue University. Five-room office, waiting room, private office, twin operating rooms with laboratory and dark room in between. Laboratory is birch and formica. Located in largest and best located professional building in city. Beautiful view from operating rooms and laboratory. Address A.D.A. Box No. 109.

•

KANSAS—For sale. Dental practice, established three years. Young dentist leaving for military service. Located in one of the very best farming and oil towns in entire state of Kansas. Immaculate two-chair office, extremely well equipped laboratory. This practice should easily pay out in six months' time. Information mailed, no obligation whatsoever on your part. C-5686 Continental, 804 Grand, Kansas City, Mo.

•

KANSAS—For sale. Dental practice. Established three years, located in one of the best farming and oil towns in entire state of Kansas. Grossing $19,000 annually, shortage of dentists in area. Ground floor location in new brick one-story building, clinic area. This well equipped office and laboratory priced to pay out very first six months. Young dentist relocating for additional schooling. Information and free pictures mailed, no obligation whatsoever on your part. C-5344 Continental, 804 Grand, Kansas City, Mo.

•

MAINE—Greater Portland. For sale. Unquestionably finest location. Modern office-home; two fully equipped operating rooms, x-ray, large laboratory with up-to-date equipment and dark room. Address A.D.A. Box No. 254 for details.

•

MASSACHUSETTS—For sale. Established dental practice. Beautiful northern N.E. community, exceptional educational facilities, year-round recreational activities, lovely lakes, nearby skiing areas. Perfect TV reception and nearby airline service. Reason: retirement. Now showing substantial yearly income. Valuable real estate with modern equipment, reasonable terms granted. Harold R. Stuart, 140 Boylston St., Boston.

•

MASSACHUSETTS—Brand new, completely equipped dental office in lovely college town, Amherst. Available immediately. Gerald F. Hogan, M.D., 71 N. Pleasant St., Amherst.

•

MICHIGAN—For rent. New dental office with two operating rooms, laboratory, dark room, private office, lavatory, receptionist vestibule. Situated in industrial area, with off-street parking and air-conditioning. No other dentist in the area. Write or telephone Dr. C. W. Nelson, 551 E. Michigan Ave., Battle Creek.

NEW HAMPSHIRE—For sale. Physician's former home-office, Farmington, N. H., 70 miles north of Boston. Eleven rooms, no down payment. Great need for dentist. Address A.D.A. Box No. 267.

•

NEW JERSEY—For sale. Well established 30 years general practice, two-chair office and equipment. Located in seashore city near New York. Retiring because of health. Address A.D.A. Box No. 246.

•

NEW JERSEY—Office for sale. Booming south Jersey area. Population over 20,000. Two-chair office with new equipment. Established 20 years. $30,000 year practice minimum. Going into specialty. Address A.D.A. Box No. 262.

•

NEW MEXICO—Two excellent openings in thriving mining and ranching county. One office established 40 years in area of 30,000 population with annual mining payroll at eighteen million dollars. Other office established 21 years in progressive county seat, college town and business center of same area. Both offices fully equipped. Ideal climate. Beautiful southwestern section of state. Altitude 5,200. Opportunities created by sudden illness. Address A.D.A. Box No. 269.

•

OHIO—For sale. Building with attractive, well-equipped, two-chair, first floor office in progressive town of 25,000. Building has additional income. Leaving to specialize. Address A.D.A. Box No. 243.

•

OHIO—For sale. Established general practice; one-chair dental office fully equipped. Owner leaving area permanently. Available immediately. Address A.D.A. Box No. 269.

•

OKLAHOMA—For sale. Fully equipped dental office, air-conditioned, ready for immediate occupancy. Dentist deceased. Write Mrs. J. R. Baker, 405 N. Witte, Poteau, Okla. Phone 473.

•

OKLAHOMA—An opportunity which comes seldom to one desiring a selective location, beautiful individual clinic, and most desirable practice—all for the cost of building and present value of equipment. Address A.D.A. Box No. 247.

•

PENNSYLVANIA—For sale or rent. Fully equipped two-chair dental offices, long established practice. Owner deceased. Write Mrs. John J. Ross, 106 Market St., Summit Hill.

•

PENNSYLVANIA — Rent or lease fully equipped office. Owner leaving for service with 400 advance appointments scheduled. Grossing $30,000. College town. 45,000 drawing population. Available March 1. Address A.D.A. Box No. 248.

•

PENNSYLVANIA—Wanted dentist to take over active practice in southeastern Pennsylvania community of 3,000. Only dentist entering service. Ground floor office space for rent, new Ritter equipment for sale or rent. Address A.D.A. Box No. 253.

•

SOUTH CAROLINA—For sale. Modern, fully equipped office. Excellent location in fast growing progressive city of Greenville. Owner wishes to leave state. Address A.D.A. Box No. 252.

•

WISCONSIN—For sale. Dental equipment includes chair, unit, x-ray, cabinet and supplies. Desire to sell intact. Rent reasonable. Office on main thoroughfare. Contact Mrs. Roy Harte, 809 N. 8th, Sheboygan.

## LOCATIONS AVAILABLE

COLORADO — Orthodontist or pedodontist wanted to share bungalow dental office with general practitioner in rapidly growing suburb of Denver. Unopposed. Completely separate facilities, including two operatories. Address A.D.A. Box No. 149.

•

CONNECTICUT—Hamden. Home and office built for use by dentist. Main thoroughfare. Excellent opportunity for thriving practice of any type. Population 34,000. For sale at reasonable price. Address A.D.A. Box No. 249.

•

NEW YORK—Opportunity for specialist. Completely equipped space in elaborate suite occupied by two busy general practitioners. Reasonable rental. Located in heart of Nassau County, old established community. Immediate occupancy. Address A.D.A. Box No. 270.

•

NEW YORK—New York City. Office space available for dental specialist, orthodontist, endodontist, exodontist. Will share waiting room with general practitioner. Address A.D.A. Box No. 271.

## OPPORTUNITIES AVAILABLE

### Dentists

CALIFORNIA—Wanted, associate in active pedodontic practice, opportunity to earn and learn. No financial outlay. Immediate income. Opportunity, if desired, for teaching. Bay area location. Address A.D.A. Box No. 225.

•

CALIFORNIA—Associate wanted for extensive well established practice, located in rapidly growing area of San Jose. Must be interested in pedodontics. If interested, will have opportunity to purchase practice in near future. Address A.D.A. Box No. 199.

•

COLORADO—For sale. Practice, and complete dental office and home which have been built for this purpose. Young dentist can earn $1,500 per month while attending medical school. Address A.D.A. Box No. 244.

•

FLORIDA—Oral surgeon seeks well trained associate to take over quality practice within a short time. Object: partial or full retirement. Address A.D.A. Box No. 251.

•

ILLINOIS—Our company is interested in finding a full-time dentist for our 850 working members. Complete facilities will be provided. Woodward Governor Company, Rockford.

•

ILLINOIS—Opportunity for young dentist in medical-dental building. Reasonable rent. Thriving community. Write Commercial National Realty, Peoria. Phone 66191, Mr. Harold Shreve.

•

ILLINOIS—Dentist wanted as public dental health administrator in Peoria. Give full details as to education and experience. Salary open. Reply to Dr. L. B. McEwen, Secretary, 1011 Main St., Peoria.

•

LOUISIANA—Pedodontist, to join general practice group. Must be qualified; Louisiana license. Located in deep south. Heavy industrial, rapidly growing city. New clinic building. Will furnish equipment, or buy yours. Address A.D.A. Box No. 255.

•

MASSACHUSETTS — Unusual opportunity for young dentist interested in pedodontics. Full-time position as director of dental clinic in new community Public Health Center in Brookline, Mass. with dental college teaching affiliation. Salary up to $5,000 per annum according to experience. Address A.D.A. Box No. 273.

OHIO—Positions for dentists available in Cincinnati school dental clinics. Salary $4 to $4.50 per hour. Vacation, sick leave and retirement benefits. Forty hours a week. A license to practice in Ohio necessary. Contact George B. Redfern, 608 E. McMillan St., Cincinnati, 6.

●

TEXAS — Residency-dental prosthodontics, splendid two-year A.D.A. approved program. All phases prosthetic dentistry; close cooperation with maxillofacial and plastic surgeons. Affiliated Texas Dental College, Texas Medical Center. Paul L. Snyder, D.D.S., VA Hospital, Houston 31.

●

VIRGINIA—Associate needed for Arlington office in new medical-dental building. Immediate income. State training and experience. Address A.D.A. Box No. 265.

●

WASHINGTON—Dentists for foreign missionary work. Excellent opportunities for qualified men in all parts of the world. For details apply to The Missionary Dentist, 5543 25th Ave., N.E., Seattle 5.

●

WISCONSIN—Director of city wide program, at a salary range of $7,239 increasing to $8,222. Five day week, pension, civil service appointment. Excellent general health program. Dr. E. R. Krumbiegel, Milwaukee Health Department, City Hall, Milwaukee 2.

### Hygienist

KANSAS—Wichita. Excellent opportunity for licensed hygienist. Highest type of practice. Have three-chair office with two x-ray units. Address A.D.A. Box No. 234.

## OPPORTUNITIES WANTED

Dentist, Ohio license, 1954 graduate, completing military service in July, desires location for general practice in northern or central Ohio. Dr. Anthony Rakoci, Jr., 813 82nd St., Newport News, Va.

●

New Jersey—Wanted. If you wish to specialize or retire, I will purchase your active volume practice, in fast growing urban or suburban community. Give details. Replies held strictly confidential. Address A.D.A. Box No. 258.

●

Oral surgeon desires association with established oral surgeon. Licensed in New York. Would take other Boards. Four years' general practice. University and three years' hospital training in oral surgery and anesthesia. Teaching experience. Military requirements completed. Address A.D.A. Box No. 261.

Dentist, 10 years' experience, wants to locate in community in Minnesota, North or South Dakota, with a population larger than 3,000. Association with older dentist preferred; the ultimate aim to take over his practice. Address A.D.A. Box No. 245.

●

New York licensed dentist; 1954 graduate, experienced in general practice, completing military service in July 1956. Interested in purchase or association leading to purchase of midtown Manhattan practice. Address A.D.A. Box No. 228.

●

Oral surgeon completing residency July 1, 1956. Wants association or established practice. Wide general practice experience. Kentucky licensed; will take Boards. Address A.D.A. Box No. 260.

●

Young dentist, family, 1954 graduate, completing military service in June, desires location, association with dentists or physicians, or group practice in Texas. Address A.D.A. Box No. 272.

●

California, licensed recently, thoroughly experienced, draft exempt, fast and gentle operator, complete dentures, attachments, crown and bridge, porcelain and veneer work. Graduate clinician hydrocolloid technic, highly proficient analgesia. Purchase or association in high gross practice. Address A.D.A. Box No. 140.

●

New England dentist. Twelve years' experience. Navy veteran, family, 38, desires position in dentistry or allied field not involving actual practice. Interested in research, selling, public health. Must be permanent. Address A.D.A. Box No. 250.

## WANTED TO BUY

Wanted to buy—Luxene foil adapter. Address A.D.A. Box No. 256.

●

Old or used dental books, journals, prints. Leo L. Bruder, 1 DeKalb Ave., Dept. 21, Brooklyn, N. Y. Dealer in out-of-print dental literature.

## MISCELLANEOUS

Dental Editing Service: Professional articles, technical theses, case reports edited and typed by service specializing in the dental field. Tape recordings transcribed. Frederica Schneider, 98-22 63rd Dr., Forest Hills 74, N. Y.

●

State Board refresher course in Los Angeles for June Board. For further information write: University of California, University Extension Dental Program, Room 211, 815 S. Hill St., Los Angeles 14.


**SOLID BRONZE NAME SIGNS**

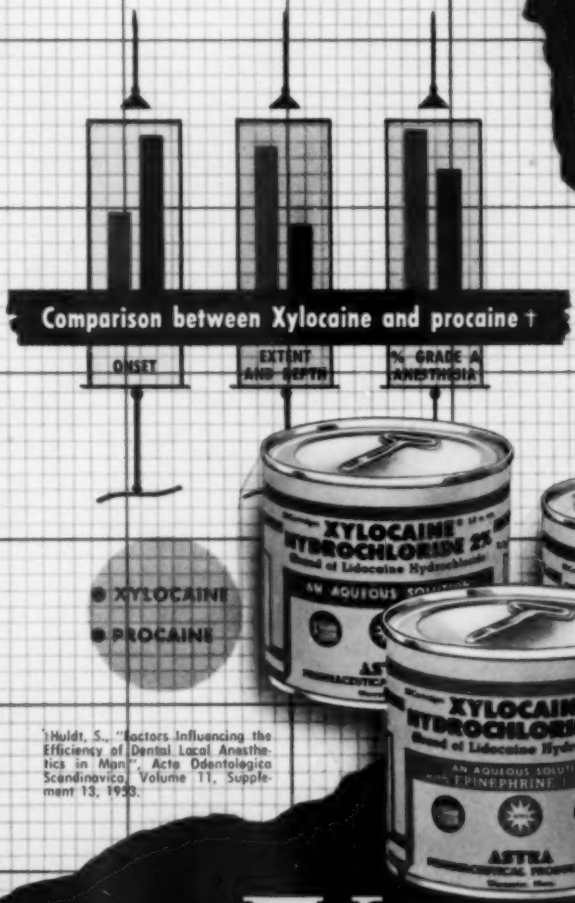
**Cast, raised letters, drilled, with screws**

| | | |
|---|---|---|
| 3" x 12" — $12.60 | 3" x 14" — $14.70 | 3" x 16" — $16.80 |
| 4" x 14" — $19.60 | 4" x 16" — $22.40 | 4" x 18" — $25.20 |
| 5" x 16" — $28.00 | 5" x 18" — $31.50 | 5" x 20" — $35.00 |
| 6" x 18" — $37.80 | 6" x 20" — $42.00 | 6" x 25" — $52.50 |

Other sizes 35c per sq. in. Minimum, $7.00. Signs with wording on both sides 60c per sq. in.

COLLECT — PLEASE SEND CHECK WITH ORDER

**LAUER METAL SHOP • 1516 E. Baltimore Street • Baltimore 31, Md.**




Council Acceptance is your assurance of high professional standards.

† Huldt, S., "Factors Influencing the Efficiency of Dental Local Anesthetics in Man", Acta Odontologica Scandinavica, Volume 11, Supplement 13, 1953.

# Xylocaine® HCl

(BRAND OF LIDOCAINE *HCl)

**a name to remember when anesthesia must be**

FAST • DEEP • SAFE • CERTAIN

**ASTRA PHARMACEUTICAL PRODUCTS, INC.**
Neponset St., Worcester, Mass., U.S.A.

*Also made and sold in Canada by*
Astra Pharmaceuticals (Canada) Ltd., Toronto, Ont., Canada

*Write for professional samples and descriptive literature*

Tops as a topical...
PRIOR TO INJECTION
and BEFORE DEEP SCALING
Council Acceptance is your assurance of high professional standards.
5%
XYLOCAINE
(BRAND OF LIDOCAINE)
OINTMENT
L5035
ASTRA
PHARMACEUTICAL PRODUCTS, INC.
Worcester, Mass.
PROFESSIONAL DISPENSETS
for dentist-directed home use . . .
• especially under new dentures
5% XYLOCAINE
OINTMENT
ASTRA
Write for descriptive literature
ASTRA
PHARMACEUTICAL PRODUCTS, INC.

the efficacy and safety of
Pentids have been confirmed
by clinical experience in
many millions of patients

# Pentids

Squibb 200,000 Units Penicillin G Potassium

tablets (buffered)
*bottles of 12 and 100*

SQUIBB

capsules (unbuffered)
*bottles of 24 and 100*
for infants and children

"PENTIDS" IS A SQUIBB TRADEMARK

*for impressions of every shape and size . . . dentists everywhere prefer*

# Jeltrate

Sales prove it: Jeltrate is the profession's first choice for full and partial impressions, regardless of complexities. Here are the reasons for this continuing preference—

- Clean, hard surface on cast
- No broken teeth
- Strength quickly developed
- Desirable setting time
- No fixing needed

Bulk can (only $4.00) contains sufficient Jeltrate for 51 one-scoop mixes or 25 two-scoop mixes (average), or 17 three-scoop mixes. Case of eight bulk cans $28.00. Individual pouches also available.

*Ask about the special introductory package of*

# inlay Jeltrate

This new product, with contrasting pink color, combines the accuracy of hydrocolloids with the convenience of Jeltrate.

For modern materials call on CAULK Milford, Delaware

# Doctor, how do you handle this common problem?

For tip and corner restorations, you can have complete confidence in

# KADON

—so efficiently placed either *by brush* or with a Crown Form

In large tip and corner fillings, no other material can take the place of Colorfast Kadon. And no other technic provides such tight adaptation . . . with so little discomfort to the patient . . . as technics perfected by Caulk resin specialists.

For successful esthetic fillings in important anterior locations, use Caulk *Cavity Primer* to make dentine and enamel chemically receptive. Then apply Colorfast Kadon.

*And for posteriors . . .*

**BYCOR** where indicated, produces fillings of lifelike appearance. This resin-silica composition offers ease of manipulation, tight adaptation, quick setting, prompt finishing.

For modern materials, call on

CAULK Milford, Delaware

## ORALLY SPEAKING...

CITRUS IS

**SAFE**

AND

**SOUND**

"Daily consumption of 8 ounces of orange juice . . . does not increase susceptibility to dental caries . . . does not cause erosion of the dental hard tissues . . ."[2]

"Persons consuming . . . 8 ounces daily of orange juice had less gingival pathology and less alveolar crest bone degeneration than . . . those who refrained from citrus fruit ingestion . . ."[2]

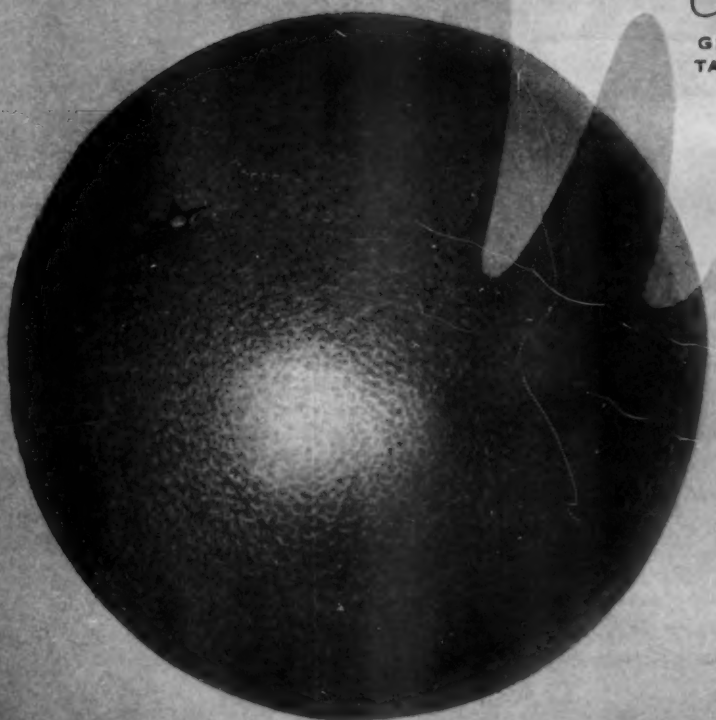
"Citrus fruits . . . help to maintain the health of the gingiva and are necessary for the health of the capillaries . . . and for proper bone growth."[1]

1. Am. Dent. Assoc.: Diet and Dental Health. 1954, p. 8.
2. Thomas, A. E.: Oral Surg., Oral Med. & Oral Path. 7:741-749, 1954.

**Florida Citrus Commission, *Lakeland, Florida***

**FLORIDA *Citrus***

ORANGES
GRAPEFRUIT
TANGERINES



Incessant as wing beats,
chewing means endless strain, endless action.
Inlay materials and the weakened tooth walls they must protect
need to have unusual strength to stand up in the mouth.
Your Ney-Oro B-2 inlays and abutments, tough yet burnishable,
should be as perfect 20 years from now as they are today.
Incidentally, the use of Ney-Oro B-2 has doubled since 1950.

**THE J. M. NEY COMPANY** Gold SINCE 1812

HARTFORD CONN.

*"DIAMOND-HARD SUPER TUNGSTEN CARBIDE"*

# BUSCH-WIDIA

**burs are made of the hardest of the tungsten carbides to add to the recognized advantages of BUSCH BUR BALANCED BLADE DESIGN and their high standards of precision manufacture. BUSCH-WIDIA BURS—second only to diamonds in hardness—are your full assurance of peak performance during their prolonged service. Busch Burs and Busch-Widia Burs are available through your dealer.**

**PFINGST & COMPANY, INC. • 62 COOPER SQUARE • NEW YORK CITY**

*It's Harmonized*

Harmonized? Yes, this word so well describes the important physical characteristics of time-tested, time-proven Odontographic alloy. For just as fine music demands proper balance and harmony of tones, so does a dense, durable amalgam filling require an alloy of balanced formula and controlled expansion . . . if it is to give enduring satisfaction.

Since the "sweetest music" you can hear is patients' satisfaction . . . specify Odontographic.

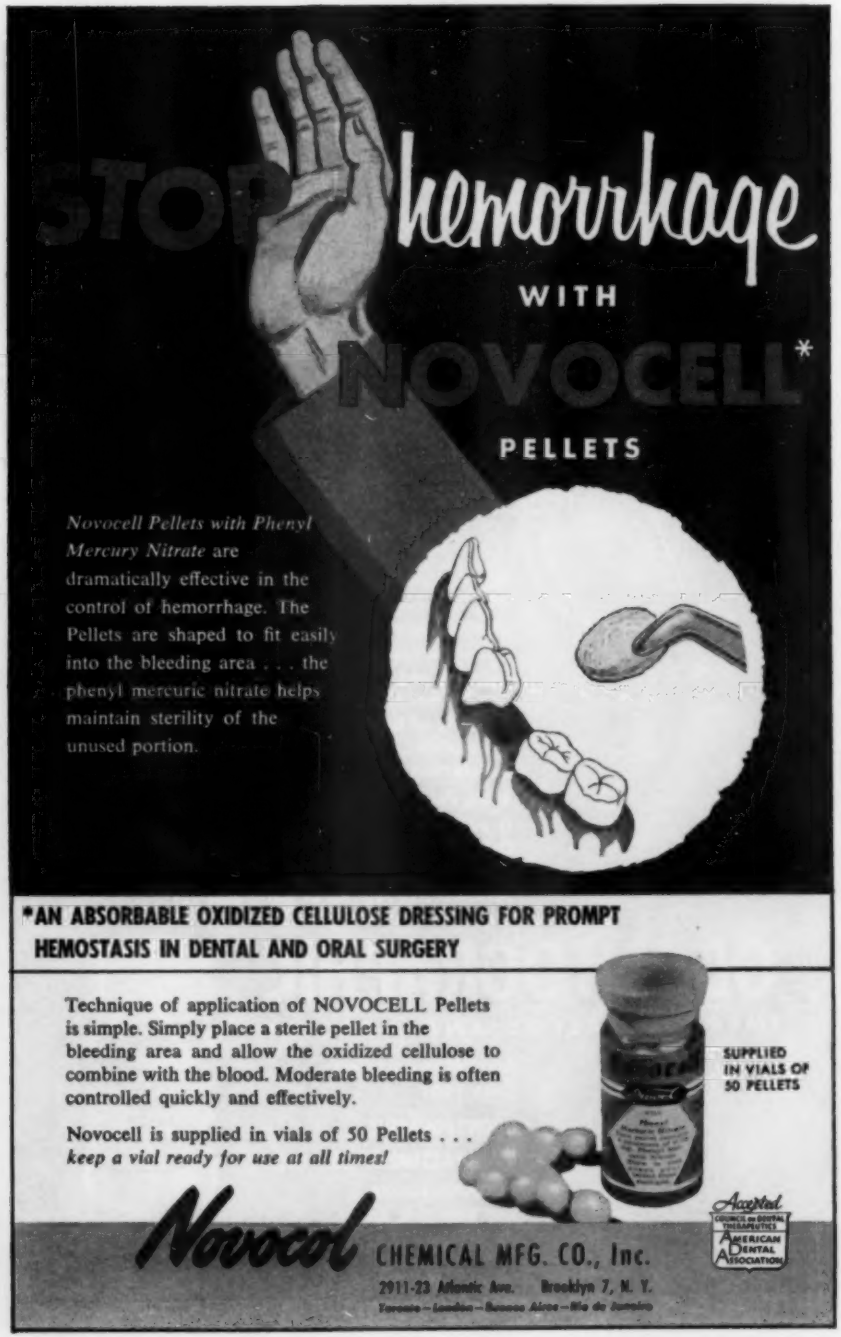
Complies with A.D.A. specifications
Available in regular or extra fine cut

**ODONTOGRAPHIC**

*IMPROVED ALLOY AND MERCURY*

Alloy Manufacturers
Since 1907

**ODONTOGRAPHIC**
**MANUFACTURING CO., INC.**
62 COOPER SQUARE
NEW YORK 3, N. Y.

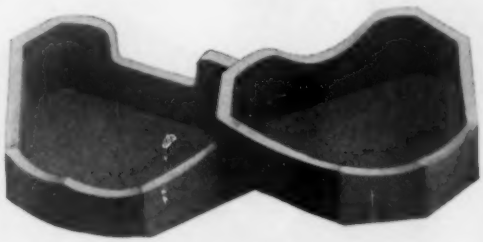

STOP hemorrhage
WITH
NOVOCELL*
PELLETS
*Novocell Pellets with Phenyl Mercury Nitrate* are dramatically effective in the control of hemorrhage. The Pellets are shaped to fit easily into the bleeding area . . . the phenyl mercuric nitrate helps maintain sterility of the unused portion.
*AN ABSORBABLE OXIDIZED CELLULOSE DRESSING FOR PROMPT HEMOSTASIS IN DENTAL AND ORAL SURGERY
Technique of application of NOVOCELL Pellets is simple. Simply place a sterile pellet in the bleeding area and allow the oxidized cellulose to combine with the blood. Moderate bleeding is often controlled quickly and effectively.
Novocell is supplied in vials of 50 Pellets . . . *keep a vial ready for use at all times!*
SUPPLIED IN VIALS OF 50 PELLETS
Accepted
COUNCIL ON DENTAL THERAPEUTICS
AMERICAN DENTAL ASSOCIATION
Novocol CHEMICAL MFG. CO., Inc.
2911-23 Atlantic Ave. Brooklyn 7, N. Y.
Toronto—London—Buenos Aires—Rio de Janeiro

# Good Models Make a Good Impression on Your Patients

FIRST impressions are often lasting. And the patient's first impression of your professional skill and meticulousness is very often based on the appearance of your study models. This is particularly so when you use study models to describe a proposed bridge or partial.

It is hard for a patient to reconcile the appearance of a carelessly-made set of study models with his vision of the beautifully natural restoration he expects to get.

A neat, clean, professional-looking study model is the first step in establishing an appreciation of your professional service and the professional fee it merits. **Actually, it is easy to make neat, symmetrical study models with—**



## COLUMBIA RUBBER MODEL-BASE FORMERS

**Make Neat Bases on Study Models**

**per Set—1 Upper and 1 Lower**

| | |
|---|---|
| No. R1X—Jumbo Size | $4.75 |
| No. R1 —Large | 4.00 |
| No. R2 —Medium | 4.00 |
| No. R3 —Small | 3.00 |

**If you do not have our Catalog No. 33, write for your copy today.**

To have perfectly smooth, symmetrical, nicely finished bases on your study models, simply pour plaster or stone into formers and mount anatomical casts. After plaster has set, a beautiful set of models is easily removed from the soft, flexible model-base formers. Directions tell how these formers enable you to make upper and lower models which occlude automatically.

The "Jumbo-Sized" Formers (No. R1X) are recommended for making bases on models of extra large impressions, such as those from alginate impressions. They eliminate all boxing-up, fussing and trimming.

**Complete Instructions with each set.**

## COLUMBIA DENTOFORM CORPORATION

"The House of A Thousand Models"—also Headquarters for Brown Precision Attachments

**131 EAST 23rd STREET** • **NEW YORK 10, N. Y.**

# Indispensable

## GOMCO ASPIRATORS

like this No. 796 Cabinet Model have proved indispensable to optimum oral treatment, because only with this powerful, dependable suction can the oral field be kept clean and clear at all times. This means better visibility — greater patient comfort — preventing foreign matter being inhaled or swallowed . . . in short, conditions indispensable to best results.

Why leave the vital question of aspiration to chance? Your dealer will be happy to show you the entire line of GOMCO Aspirators for every need and budget — and to demonstrate GOMCO quality and performance in action in your office.

Gomco No. 796
Cabinet Aspirator

GOMCO SURGICAL MANUFACTURING CORP. 824-D E. Ferry St., Buffalo 11, N.Y.

For convenient, effective antibiotic therapy in dentistry, consider

ACHROMYCIN CAPSULES

Patients, universally, prefer to take medicine orally rather than by injection. ACHROMYCIN Capsules provide you with a potent antibiotic in this patient-accepted form.

ACHROMYCIN*

TETRACYCLINE

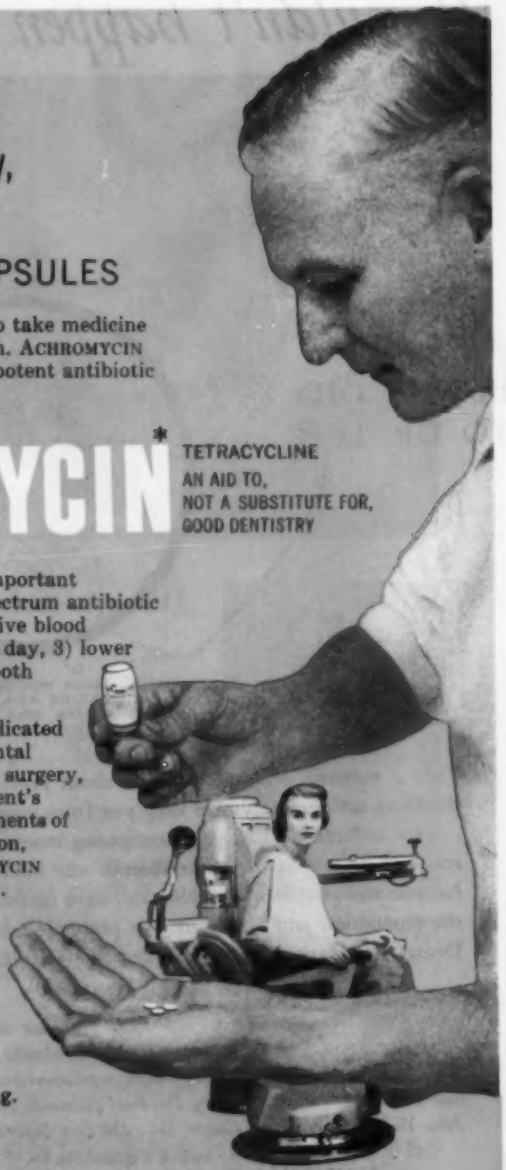
AN AID TO, NOT A SUBSTITUTE FOR, GOOD DENTISTRY

They also offer three other important advantages: 1) true broad-spectrum antibiotic activity, 2) continuous, effective blood levels on only four capsules a day, 3) lower cost, thus saving money for both you and the patient.

ACHROMYCIN Capsules are indicated as an adjunct to accepted dental techniques in extractions and surgery, and in the treatment of Vincent's infection and bacterial components of gingivitis. On your prescription, patients may secure ACHROMYCIN Capsules from any pharmacy. Available to you from your usual source of supply.

FREE. *For your convenience in prescribing* ACHROMYCIN, *Lederle has prepared special prescription pads. Write for yours today!*

Capsules: 250, 100, and 50 mg.
Soluble Tablets: 50 mg.



*REG. U.S. PAT. OFF.

Lederle

LEDERLE LABORATORIES DIVISION *American Cyanamid company* PEARL RIVER, NEW YORK

# *"It couldn't happen to me . . ."*

Dr. D* . . . had to give up his practice when he was afflicted with dermatitis of both hands shortly after he purchased ADA insurance coverage. In your case, as in Dr. D's, office time represents your income. Respect it and insure it.

***Take a moment, please*** . . . Think about protecting your income should disabling accident or illness keep you from your practice. ***Be prudent, too*** . . . See beforehand that your continuing income depends upon your presence in your office; that your absence may mean loss of financial security for you and your family. ***Think*** . . . have forethought and apply now for the economical and liberal income protection afforded by your American Dental Association Group Accident and Health Insurance Plan.

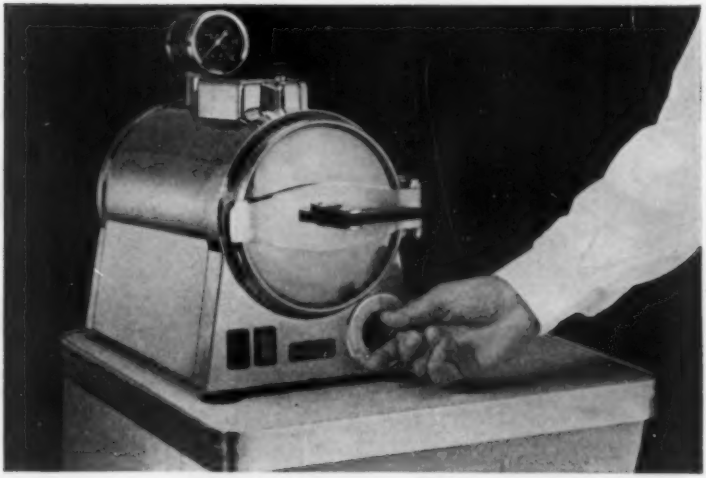
**You save 35 to 50 per cent of the cost of similar protection individually purchased.**

*For complete information regarding benefits, regulations and semi-annual rates, communicate with the Trustee of the Policy, Dr. Paul Zillmann, 29 Walden Avenue, Buffalo 11, New York or with M. A. Gesner, Inc., 150 East Superior Street, Chicago 11, Illinois.*

**Issued Exclusively by**
**NATIONAL CASUALTY COMPANY of Detroit**
**Through**
**M. A. GESNER, INC.**

**150 East Superior Street** **WHitehall 3-1525** **Chicago 11, Ill.**

*Since the National Casualty Company's plan of accident and health insurance has been in effect for many years in New York, New Jersey, California, Utah and Nevada, the Association Plan is not available in those states.*



## Set *ONE* dial, it's that simple!

All you do is put materials into the SpeedClave . . . the time switch does the rest.

No valves to turn—no watching. In 15 minutes instruments are sterilized *with Hospital Safety.* (5 minutes less if SpeedClave is hot.) What could be simpler or easier?

Then SpeedClave shuts off automatically. Saves electricity, cuts heat in your office. And you have the unquestionable SAFE ANSWER TO THE QUESTION, "IS A BOILED NEEDLE A SAFE NEEDLE?"

For the low, low price, see your dealer, or write for descriptive bulletin DS-246.

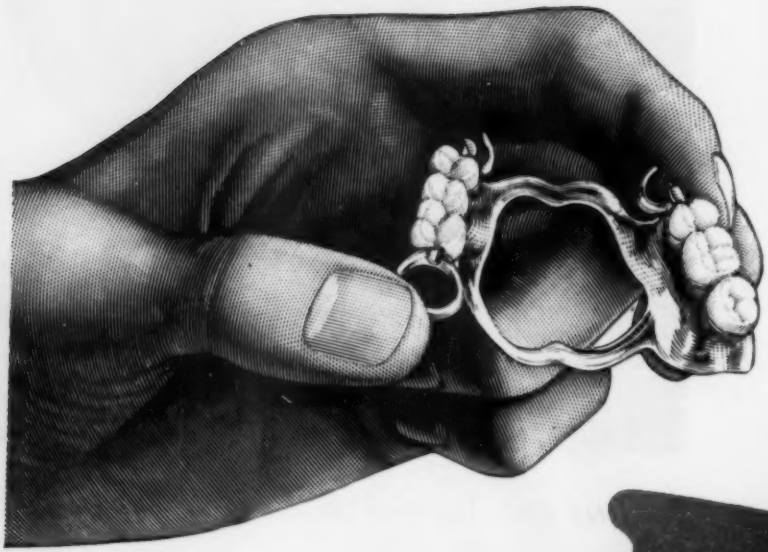
88 Single Cabinet is ideal mounting for your "777". "Spacemaker" top nearly doubles your work area.

Dr._____

_____

*Castle* LIGHTS AND STERILIZERS

WILMOT CASTLE CO. • 1746 E. HENRIETTA RD. • ROCHESTER, N. Y.



VITALLIUM®

AUSTENAL LABORATORIES, I

# *Standard of Quality...*

## VITALLIUM® RESTORATIONS

Common sense and good business practice prohibit paying a little and getting a lot. When you pay too little, you sometimes lose everything. The thing you bought may be incapable of doing the job, and you assume an unjust risk.

This standard of quality is well known to the VITALLIUM Processing Laboratories. They are engaged with you in a common task. They undertake to provide you with restorations at charges which are always reasonable, and in keeping with the high quality of the materials they use and the advanced skills of their technical staffs.

S, INC. NEW YORK • CHICAGO

® By Austenal Laboratories, Inc.

# *Announcing*

# National Board Examinations

**April 2-3, 1956**

*(Applications should be received by March 1, 1956)*

**December 3-4, 1956**

*(Applications should be received by Nov. 7, 1956)*

States and Agencies that recognize National Board Certificate

| | |
|---|---|
| ALABAMA | NEW HAMPSHIRE |
| COLORADO | NORTH DAKOTA |
| CONNECTICUT | OKLAHOMA |
| ILLINOIS | OREGON |
| INDIANA | PENNSYLVANIA |
| IOWA | RHODE ISLAND |
| KANSAS | SOUTH DAKOTA |
| KENTUCKY | UTAH |
| LOUISIANA | VERMONT |
| MAINE | VIRGINIA |
| MARYLAND | WASHINGTON |
| MASSACHUSETTS | WEST VIRGINIA |
| MICHIGAN | U. S. PUBLIC HEALTH |
| MINNESOTA | U. S. ARMY |
| MISSOURI | U. S. NAVY |
| NEBRASKA | ALASKA |
| NEVADA | HAWAII |
| | PUERTO RICO |

*Brochure describing the National Board Dental Examinations may be obtained by writing:*

Council of the National Board of Dental Examiners

**AMERICAN DENTAL ASSOCIATION**

222 EAST SUPERIOR ST. -:- CHICAGO 11, ILLINOIS

for caries-active patients *prescribe*

Amurol

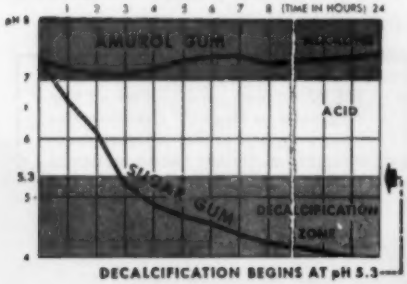
NON-CARIOGENIC

# Sugarless Gum

Sold through drug, department and health food stores. Samples and literature on request. Please give druggist's name, address.

AMUROL PRODUCTS COMPANY
116 S. MICHIGAN AVE., CHICAGO 3, ILL.

**Comparative *in vitro* Effects of Sugar Gum and Amurol Gum added to Saliva**




**DECALCIFICATION BEGINS AT pH 5.3**

As shown above, pH of caries-active saliva *in vitro* remains in alkaline zone for hours with AMUROL SUGARLESS GUM, whereas with sugar gum the pH drops to the acid level under the same conditions.

THE EMBLEMS OF RELIABLE PROTECTION SINCE 1902

We cordially invite your inquiry for application for membership which affords protection against loss of income from accident and sickness (accidental death, too) as well as benefits for hospital expenses for you and all your eligible dependents.

all premiums come from → PHYSICIANS SURGEONS DENTISTS ← all benefits paid to

PHYSICIANS CASUALTY AND HEALTH ASSOCIATIONS
Omaha 2, Nebraska

$4,500,000 ASSETS
$22,500,000 PAID FOR BENEFITS

# Okay?

More than O.K.! According to many dental authorities it's a practical answer to several problems your patients need to overcome in their everyday oral hygiene.

A crisp juicy apple safely satisfies the urge for refreshment or a snack. It provides exercise and succulent cleansing action as it is enjoyed—a good ending for the youngster's school lunch.

Your suggestion to mothers to keep apples on hand is a practical and effective one. Their appeal provides a surprisingly effective help in establishing a sound pattern of healthful dietary habits.

**NEW** 16 mm. color and sound film "Gateway to Health." Case histories from a typical practice demonstrate influence of dietary habits on dental health. Available from JADA film library or write to address below.

NATIONAL APPLE INSTITUTE 726 JACKSON PLACE, N. W. WASHINGTON 6, D. C.

*in behalf of*

**THE APPLE GROWERS OF AMERICA**

# 6 REASONS why you should buy Ash DENTAL INSTRUMENTS

- Uniformity
- Superior Craftsmanship
- Exactness to Pattern
- Finest Stainless Steel
- Sharp Cutting Edges, Durable Working Surfaces
- New, Long-Lasting "Lustra Finish"

*Remember . . .*

There's an Ash instrument for every dental need. And remember, too, when you buy instruments, insist on genuine Ash instruments . . . look for the name "ASH ENGLAND" on the handle.

ASH AMALGAM INSTRUMENTS
DOUBLE-END

Claudius Ash, Sons & Co., Inc., U.S.A.
309 Main Street • Niagara Falls, N. Y.

# CUT TOOTH STRUCTURE FAST

with less vibration

# USE S.S. WHITE CARBIDE BURS

Where speedy, accurate cutting counts, you can rely on S. S. White Carbide burs. They are specifically made for long lasting efficiency in cutting tooth structure. Heads are Tungsten Carbide. Shanks and necks are chrome-plated. All burs are six-bladed, except numbers 6, 7 and 8 which have eight blades. Fissure bur blades are helically cut for fast cutting speeds and less vibration. Inverted Cone blades have slightly rounded corners for added strength. Order from your dental salesman.

Round Nos. 2, 3, 4, 5, 6, 7, 8
Wheel No. 14

Inverted Cone Nos. 35, 36, 37, 38, 39

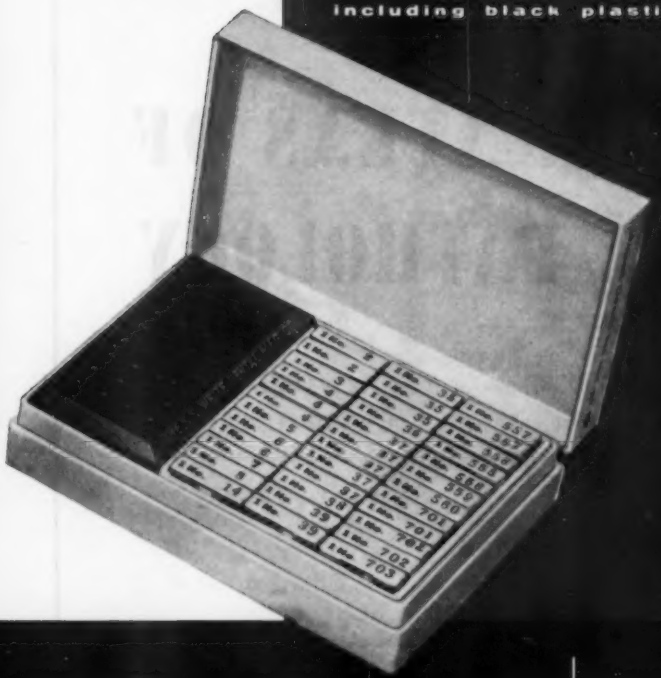
Fissure Nos. 59, 557, 558, 559, 560, 701, 702, 703

you can save $10

with

ASSORTMENT 36A

including black plastic block



| CONTENTS: | | at unit prices | No. 36A Assortment |
|---|---|---|---|
| | 11 round burs | | |
| | 1 wheel bur | $57.60 | $47.60 |
| | 12 inverted cone burs | | |
| | 12 fissure burs | Savings | $10.00 |
| | 36 | | |

Plastic blocks retail for 50 cents when purchased individually

THE S. S. WHITE DENTAL MFG. CO.

Philadelphia 5, Pa.

LIPPINCOTT

*A New, Comprehensive Source of Reference*

# COLOR ATLAS OF ORAL PATHOLOGY

Prepared under the auspices of the U. S. NAVAL DENTAL SCHOOL of the NATIONAL NAVAL MEDICAL CENTER, Bethesda, Maryland

•

*This is a magnificent work with 461 figures in full color!*

*Reproductions provide excellent standards of comparison . . .*

*Aids in the study and interpretation of clinical, roentgenographic, and microscopic findings . . .*

# LIPPINCOTT

## *Color Atlas of Oral Pathology Includes . . .*

Oral Histology and Embryology

Developmental Disturbances

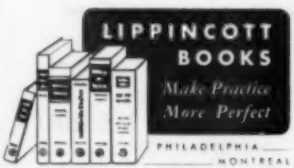
Diseases of the Teeth and Supporting Structures

Diseases of the Oral Mucosa and Jaws

Neoplasms

*In the descriptive text opposite the color illustrations, the clinical findings are coordinated with the microscopic presentation.*

**160 Text Pages • 461 Full-Color Figures • $12.00**




**J. B. LIPPINCOTT COMPANY**
East Washington Square, Philadelphia 5, Pa.
In Canada, Medical Arts Bldg., Montreal

**Please enter my order and send me:**

**COLOR ATLAS OF ORAL PATHOLOGY...$12**

NAME _____ ☐ Charge my account

ADDRESS _____ ☐ Check enclosed

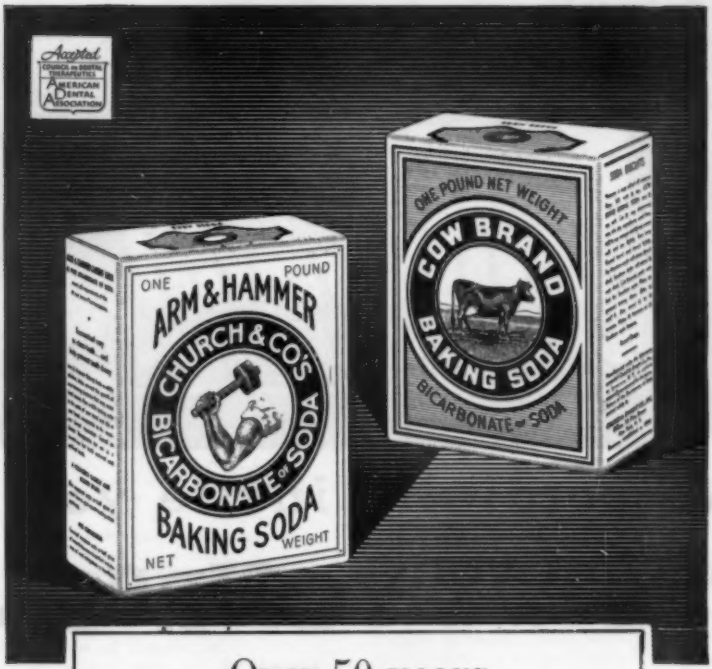
CITY _____ ZONE _____ STATE _____

1. Automatic Reset Timer
2. Full-view easy to see reset dial!
3. Koiled Kord—Timer Hand Switch extends to *15 feet* for maximum protection against stray radiation
4. Variable Kilovoltage 50 to 70 in 2½ KV steps
5. Milliamperes — 0 to 15
6. Pre-Lit Filament reduces exposure time
7. Dual Pilot Lights

*Doctor... You have a* RIGHT *to expect more from WEBER!*

**The WEBER Dental Manufacturing Co.**

CANTON 5, OHIO




## Over 50 years still one of the finest toothpowders

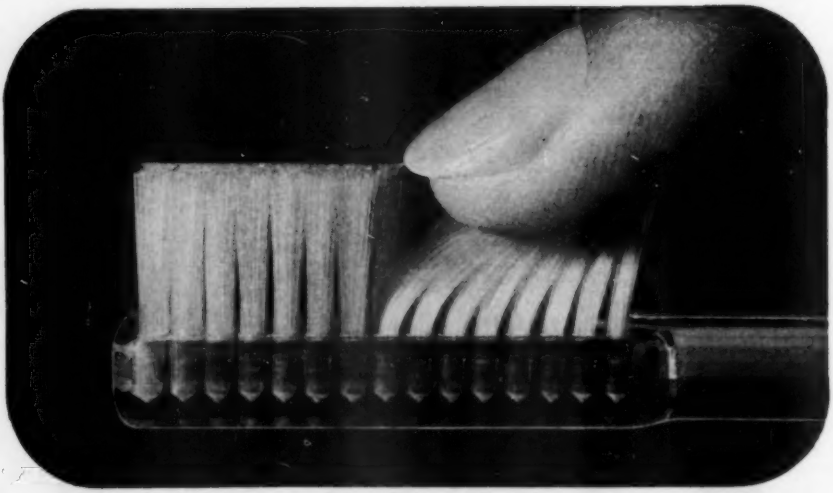
Accepted by the Council on Dental Therapeutics of the American Dental Association as Sodium Bicarbonate U. S. P.

***FREE Children's Booklets***—We would like to send you children's booklets for your waiting room. They are approved by leading educators. Just write to us at the address below.

*Church & Dwight Co., Inc.*

**70 Pine Street** • **New York 5, N. Y.**

***BUSINESS ESTABLISHED IN 1846***



# We cordially invite you to

# TEST IT YOURSELF

Professional men generally agree that, regardless of the dentifrice used, a toothbrush is the most important factor in maintaining good oral hygiene.

Since dentists are unquestionably the most qualified persons to select the proper type of brush, the wisest people take their advice on this matter. In this way the best brush is chosen to fit each patient's needs.

If you are unfamiliar with the Oral B Toothbrush, we suggest that you try it yourself. Then pass judgment on its effectiveness for use on both teeth and gums. The soft, flexible filaments are extremely small, with flat tops which minimize abrasion of tooth structure and injury to gingival tissue. In effect it becomes two brushes in one.

If you wish a complimentary brush, please mail a request on your professional letterhead.

*First introduced in February, 1949*

**Oral B**
TOOTHBRUSH

*Write today for a supply of convenient prescription pads which have been prepared for the many doctors and hygienists who wish to prescribe the Oral B.*

**448 SOUTH MARKET ST. • SAN JOSE 13, CALIFORNIA**

# Saunders Dental Books

## Wheeler's Tooth Form Drawing and Carving

**Valuable to practicing dentists, their assistants and hygienists. 453 illustrations help you achieve accurate drawing and carving. They create quick mental pictures of proportion and make details easy to remember. Included are actual photos of specimens, idealized drawings of teeth and close-up views of complete dental arches.**

**Aspects of each individual tooth are covered in minute detail. Step-by-step instructions are given for drawing teeth to scale and for carving tooth forms in wax and other hard materials.**

By RUSSELL C. WHEELER, D.D.S., F.A.C.D., Associate Professor of Dental Anatomy, St. Louis University School of Dentistry, 1937-1944; Washington University School of Dentistry, 1945-1951. 106 pages with 453 illustrations on 124 figures. $4.50. *Second Edition.*

## Applegate's Partial Denture Prosthesis

***This practical book tells you how to:***

1. **Make a good study cast of the patient's mouth and survey it thoroughly and correctly.**
2. **Prepare mouth and make abutting teeth more efficient anchors.**
3. **Make necessary repairs and improvements in the mouth as indicated by the study cast. Correct situations likely to interfere with comfort, stability and function of prosthesis.**
4. **Make a second cast of the treated mouth.**
5. **Manufacture, or have manufactured, the appliance based on the second cast.**
6. **Insert and adjust completed appliance in the patient's mouth.**
7. **Evaluate the significance and relation of partial dentures to care of the whole mouth.**

By OLIVER C. APPLEGATE, D.D.S., D.D.Sc., F.A.C.D. Professor of Dentistry, School of Dentistry and W. K. Kellogg Foundation Institution: Graduate and Postgraduate Dentistry, University of Michigan. 323 pages, 8¼" x 11". 352 illustrations (10 in color). $10.00.

## Pelton & Wisan's Dentistry in Public Health

**Here is a book giving *completely workable* outlines of dental health programs which can be put to immediate use in *any* community. New information and concepts which have come along in the last few years are all incorporated.**

**This is one of the clearest and best organized statements of the capacities of dental public health today.**

Edited by WALTER J. PELTON, D.D.S., M.S.P.H., Dental Director, Chief, Division of Dental Resources, Bureau of Medical Services, United States Public Health Service, Washington, D. C., and JACOB M. WISAN, D.D.S., M.S.P.H., Chief, Dental Health Section, Dept. of Public Health, Philadelphia, Pa. In collaboration with JOHN T. FULTON, D.D.S., JOHN W. KNUTSON, D.D.S., Dr. P.H. and ALBERT L. RUSSELL, D.D.S., M.P.H. 282 pages, 6" x 9", illustrated. $6.50. *Second Edition.*

*30 day free examination!*

***W. B. Saunders Company*** West Washington Sq., Phila. 5

Send for 30-day examination and charge: Easy Payment Plan ($3 month)

- ☐ Wheeler's Tooth Form Drawing & Carving.....$ 4.50
- ☐ Applegate's Partial Denture Prosthesis.....$10.00
- ☐ Pelton & Wisan's Dentistry in Public Health.....$ 6.50

Name_____

Address_____ ADA 3-56

# What happens...

# when the patient examines YOU?

If what your patient sees and hears gives him confidence in your ability to help him without too much pain — in either the mouth or the pocketbook — your job of getting his co-operation, respect, continued visits and prompt payment, is tremendously simplified.

One of the most important results of Professional Budget Plan in your practice will be the atmosphere of relaxation you and your patients discover. Most of all, *you* begin living, instead of "working." You owe it to yourself to find out about P. B. P. *now.*

*It's easy to learn more. The P. B. P. representative will be happy to make an appointment at your convenience. Just let us know when you'd like to see him.*

## PROFESSIONAL BUDGET PLAN

303 East Wilson Street, Madison 3, Wisconsin • Dept. AD-36

# TEETH

## ARE THE MOST IMPORTANT PART OF A DENTURE!

12 character molds in 46 sizes provide symmetrical arrangements of teeth for truly balanced harmony. Should your preference be asymmetrical arrangements, interchanging molds or shades will provide an almost infinite number of personalized set-ups. Regardless whether your conception of the ideal arrangement of teeth be symmetrical or asymmetrical, for dentures unparalleled in esthetics, prescribe Micromold porcelain teeth.

*Micromold®*
PORCELAIN TEETH

*REPRODUCED FROM NATURAL TEETH

® By Austenal Laboratories, Inc.

*Prescribe to obtain Micromold Porcelain Teeth through your Vitallium Laboratory*

**AUSTENAL LABORATORIES, INC.**

224 EAST 59TH STREET, NEW YORK 16, N. Y. 5101 KEELER AVE., CHICAGO 32, ILL.

# NOW...

**a mixing pad type of rubber-base elastic impression material for . . .**

**INLAYS**

**CROWNS**

**BRIDGES**

***It's Permanent***
Models do not have to be poured immediately. Impressions are dimensionally stable. No moisture loss. No moisture pickup.

***It's Elastic***
springs over severe undercuts.

***It's Tough***
won't break or tear.

***It's Accurate***
copies minute detail, remains stable.

***It's Simple***
just spatulate, place in tray or band, carry to mouth.

***It's Correctable***
can be added to. Bonds ideally.

***It's Versatile***
can be used in tray or copper band.

***It "Follows Through"***
producing hard-surface models.

**THAT'S KERR PERMLASTIC!**

*Order this great new product from your Kerr dealer TODAY!*

**KERR PERMLASTIC**
the permanent elastic impression material!

KERR MANUFACTURING COMPANY
**KERR PERMLASTIC**
DETROIT 8, MICH., ESTABLISHED 1891

# NEW!

# BAKER

## Deoxidized CASTING Golds

**You will immediately see the difference in golds made by the Baker Deoxidizing Process.**

**They melt, cast and finish easier, cleaner and much denser—especially when using the new natural or mixed gas supply now used in most cities.**

**Castings made of these adjusted alloys are so free from microscopic surface porosity that they are exceptionally resistant to all mouth tarnish. A small trial order from your dealer will convince you.**

SEND FOR PHYSICAL PROPERTIES CHART, DESCRIPTIVE LITERATURE AND PRICE LIST

*BAKER DEOXIDIZED GOLDS ARE AVAILABLE IN . . .*

**INLAY SOFT A • INLAY MEDIUM B • INLAY HARD C**

**BAKER 75—*extra hard rich color bridge gold***

**CHICAGO 4—all purpose partial and removable bridge gold**

**UNICAST—popular all purpose economy gold**

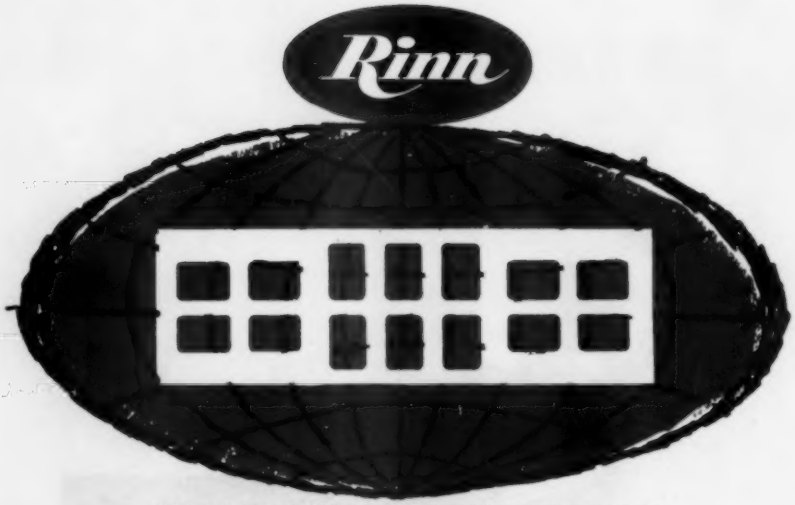
## BAKER & CO., INC.

**850 PASSAIC AVENUE • EAST NEWARK, N. J.**

**NEW YORK CITY** 30 Church St. • **CHICAGO** 55 E. Washington Street • **SAN FRANCISCO** 760 Market Street

BAKER

THE WORLD'S LARGEST WORKERS AND REFINERS OF PRECIOUS METALS




STANDARD OF THE WORLD

RINN X-RAY

# Film Mounts

*Every requirement and every need is served through Rinn's versatile and exclusive line...*

Known and preferred throughout the world, Rinn X-Ray film mounts combine unexcelled durability, ease of mounting and the greatest variety ... a winning combination that meets the requirements of practitioners and dental colleges everywhere.

The suitability of Rinn mounts for every need reflects Rinn's attitude of improved products for superior dental radiographs. If you haven't already investigated the wide choice of X-Ray film mounts available in the full Rinn line, ask your dental dealer or write to:

Rinn X-Ray Products, Inc.
2929 N. Crawford Ave.
Chicago 41, Illinois

**LEADERS IN DEVELOPMENT OF DENTAL X-RAY TECHNIQUES AND PRODUCTS**

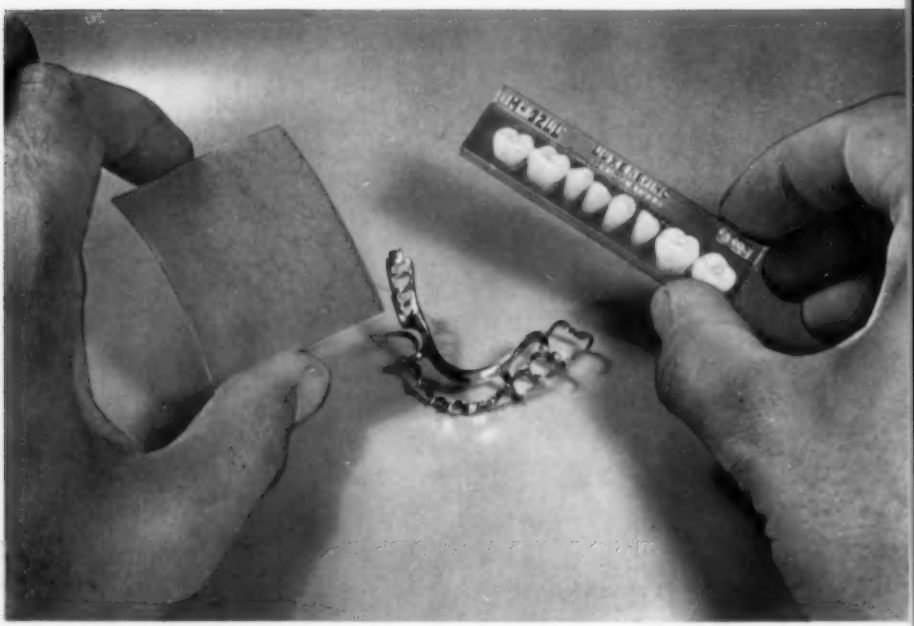
*mouth comfort with dentures that simulate natural gums*

When you prescribe Luxene 44 denture material with Luxene Teeth, you will have delivered a superlative denture which provides a most accurate reflection of nature.

## *IT TAKES ALL FOUR,*

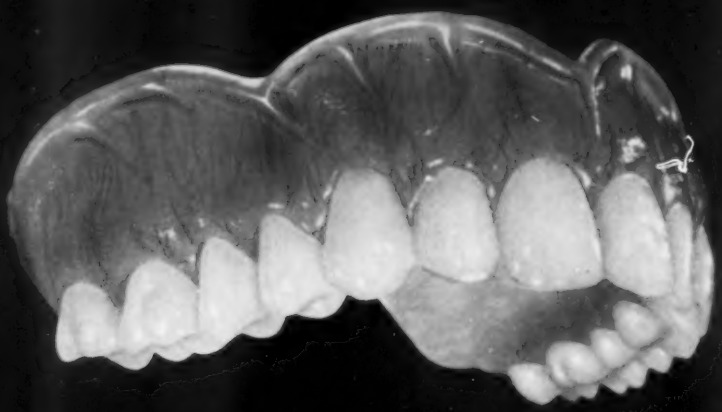
## *PLUS ONE THING MORE . . .*

## *TO MAKE YOUR PARTIAL DENTURES SCORE!*



Providing the impression is accurate and the stone model properly mixed and poured, you can be completely assured that

1. The metal skeleton will fit the original model.
2. Luxene attachments will not break away.
3. Luxene teeth are cured to the base and they do not crack or craze.
4. Clinical records reveal unusually high resistance to abrasion and complete compatibility with natural teeth.
5. *Plus one thing more . . .* Skilled hands — with natural ability, experience and a desire to serve.



## THE ALL LUXENE 44 C-TONE DENTURE

Oral pathologists from several prominent universities say after examining many different samples that the C-Tone effect produced by fibres incorporated in Luxene 44 — reproduces natural gum tissue and matches nature with great fidelity.

These same authorities have commented on Luxene teeth. They say the ability to absorb light like natural teeth provides a great step forward in the attempt to match the appearance of natural teeth under all light conditions.

The chemical combination of Luxene 44 and Luxene teeth results in a practical denture that provides a sanitary feature not possible when porcelain teeth are used.

**PUBLISHED ON BEHALF OF LUXENE SELECTED LABORATORIES**

**EACH LUXENE**

**LABORATORY ACCOMPLISHES**

**THE DOCTOR'S GOAL BY**

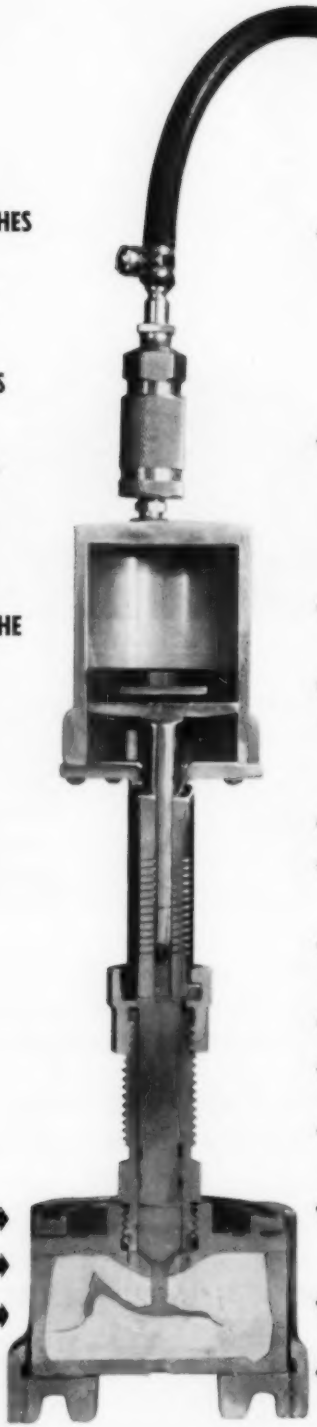
**THE USE OF THE FAMOUS**

**PRESSURE CAST PROCESS.**

**THIS CASTING PROCESS**

**VIRTUALLY ELIMINATES THE**

**RAISED BITE ERROR.**



Hose to compressed air supply.

Air gun coupler permits an easy connection to air supply.

Air gun cylinder.

Air gun cup.

Air gun piston.

Air gun guide indicates amount inject

Hole in piston enables operator to remo the piston by slipping metal rod throu the hole and pulling it up. This is nec sary for recharging.

Air gun adapter.

Piston.

Nozzle threaded to screw into air g adapter.

Lid and bottom surface perfectly flat so as to close uniformly.

Sprue button.

Side of cage.

Flask splits here. Notice how perfectly closed — metal to metal contact.

In the center of the flask is a cross-secti of the moulded denture having no fl

Bottom ring of the "cage" which, wh tightened in cage closer, closes the fla perfectly.

Printed in U.S.A
44-55 B

# PATIENT LOVES DENTIST

Patients accept dental care more readily when the fear of pain is allayed. By making BUFFERIN a part of your pre- and post-treatment routine you can minimize the discomfort of dental procedures, and thus gain the cooperation of your patients. The side effects, nausea, heartburn, which follow the use of straight aspirin by some patients, are markedly less when BUFFERIN is the analgesic used.

Accepted COUNCIL on DENTAL THERAPEUTICS AMERICAN DENTAL ASSOCIATION

GIVE **BUFFERIN.**

**Acts Twice as Fast as Aspirin**
**Does Not Upset the Stomach**

Each BUFFERIN tablet contains 5 grains of acetylsalicylic acid and the antacids aluminum glycinate and magnesium carbonate.

**BRISTOL-MYERS COMPANY, 19 West 50 St., New York 20, N. Y.**

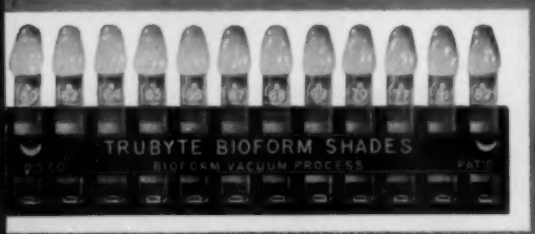
# B stands for BLENDS

**blend,** 1. blend; 2. blĕnd, v. It.
To mix so that the components of the mixture can not be separated or distinguished; mingle and combine into one uniform product; connect intimately; cause to shade imperceptibly into one another; as to blend different races; to blend colors, wines, furs, etc.

# B also stands for BIOFORM®

. . . and it's the *natural blending* of shades in Trubyte Bioform which accounts for their natural, vital and radiant appearance in the mouth. Trubyte Bioform Teeth are blended *just like natural teeth* . . . shaded in the set *just like natural teeth* . . . and accurately reproduce the colors *found in natural teeth.* Only Trubyte Bioform vacuum fired porcelain offers such superbly natural tooth shades.

Start specifying "B For Bioform" today, and you'll note immediately the improved esthetic appearance of your complete and partial denture cases.




WHEN YOU SPECIFY TOOTH SHADES . . .

specify the B FOR BIOFORM

**TRUBYTE BIOFORM** THE FIRST VACUUM FIRED PORCELAIN TEETH

***ASK YOUR TRUBYTE DEALER** to show you the "10 Features of Trubyte Bioform Color Superiority"*

**THE DENTISTS' SUPPLY COMPANY OF N.Y.**
York, Pennsylvania